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THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN. THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES EQUIPMENT AND SUPPLIES ASSOCIATION.

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Forthcoming Events.

OCTOBER 9.

Institution of Welding Engineers:—Ordinary meeting at Manchester. J. Ryder will read a Paper on "The Training of Operators in the Welding and Cutting Industries."

Institute of British Foundrymen.

OCTOBER 4.

Lancashire Branch:—Opening meeting at Manchester. Presidential address by R. W. Stubbs.

OCTOBER 11.

Lancashire Branch (Burnley Section):—Opening meeting at the Technical College, Burnley. "Belgian Moulding Sands in the Iron Foundry," Paper by F. Griffiths.

Clearing the Air.

The object of our comment on "Vallishe's" original article on semi-steel was to stress that this nebulous material had a market amongst engineers, and to point out that, as it was not recognised by official specification, it lent itself to charlatism. Further, we indicated that the marketing of castings under a trade-marked name was preferable. From published and private correspondence on the subject, we confess that there is an honest and sincere demand amongst the smaller foundries for a legal definition, if not a specification. Older readers will remember that this subject was thoroughly thrashed out some eight years ago in this column, and has been revived from time to time as the various developments indicated its desirability.

We feel that we can assure the smaller foundries that they will receive very little support from the scientific associations in the industry in any effort to frame a specification, as there are no means of checking by chemical or physical means whether a certain percentage of steel has been added, because of the profound influence of melting conditions.

Thus, if there is a serious demand for legal definition and specification then, it must be done by the commercial side of the industry. We are conscious of the fact that the various employers' federations count a number of high grade technicians amongst their membership, and there is a strong possibility of internal opposition to any such proposal. If "Vallishe's" and "Riley's" foundries desire to maintain the goodwill they have created for semi-steel, they would be well advised to acquire a brand name, because we can assure them that, in enhancing the good name of semi-steel, they are creating a super-structure built upon the poorest possible foundations, because, as is well known, the factor of melting conditions is paramount in influencing quality. In any discussion on semi-steel it must be recognised as a fundamental that there are two aspects—the scientific and commercial—and each department will have to work out their destiny independent of the other, as co-operation is almost an impossibility, as the scientist will stress lack of workable premises.

German Progress.

One of the most astonishing features of post-war Europe has been the remarkable extent to which Germany has come back as an industrial power. Deprived of her overseas territories and of large areas of her original European empire of vital industrial importance, she had every excuse to feel industrially crippled. To-day, in spite of unemployment on a scale at least as great as that in this country and in the U.S.A., she is virtually where she was. What is the reason, and is there any lesson in it for other countries?

There are several reasons. The people work hard. They are striving with every nerve to regain for Germany its place in the sun. They take lower wages, although Germany is in advance of many countries in social services. They supply the customer with what he wants at prices he can afford to pay, from catalogues in his own language or through travellers who can speak his language. They are represented at all international gatherings and conventions. But there is one feature we wish to stress at present to the exclusion of the rest, and that is German progress in research. German is perhaps the language more essential to the scientific worker than any other. Research is used to create new materials and new processes, and hence new markets.

There is in Germany a great organisation, the founders of which saw the necessity for cultivating scientific research apart from the universities. Specialisation and the growth of science make it difficult for a professor to do justice both to his educational work and to the whole of the research work in the field he has to work in, however successfully he may cultivate part of it.

This society works largely by discovering and endowing men of talent and genius, and the opportunities are arranged for the man rather than men found for opportunities. Over thirty institutes are now run by this body, one of which, the Iron and Steel Research Institute, of Düsseldorf, has been described in our columns. The director of one of these institutes frankly admits that German research had been largely necessary to enable Germany to make the best of the rather indifferent raw materials at her disposal, as England had the pick of the world's best. This economic handicap has turned out a veritable gold mine for German industry. For the first time in modern history, we are told, Germany's export trade has exceeded the British. How far is that due to her persistence and enthusiasm in research? If it is, should Great Britain not really begin to carry out research work and not merely pay it lip service? We spend shillings where pounds would be an industrial investment of the first magnitude and a premium against risk of trade depreciation in future. It is comforting in a way to think that there is at least one thing we can do to catch up. Otherwise the outlook would be black

Correspondence.

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

Semi-Steel.

To the Editor of The Foundry Trade Journal.

Sir,—In your issue of September 4, 1930, you published an article under the title "Semi-Steel Castings," and written by me. A leader appeared in the same issue which strongly criticised the merits of the article, and following this were letters from "Riley" and Mr. J. Smeeton in the issues of September 11 and 18 respectively. Without doubt the subject of semi-steel is one which evokes great interest, and where we have interest, criticism is bound to ensue.

Editorial Comment.—The article in question was dealt with purely from the commercial standpoint, the chemical and physical properties briefly outlined therein being given for sake of comparison only. To state that "the technical value of the contribution is virtually zero . . ." is somewhat correct, yet hardly a fair criticism. Reference is made to breaking stresses of cast iron and semi-steel respectively, viz., 11.5 tons and 14.6 tons per sq. in. No doubt the figures appear very ordinary indeed, and certainly, on the face of it, call for strong criticism. It should, however, have been mentioned in the article that these figures were obtained from tests on an Admiralty test-bar (1 in. × 1 in. × 12 in. span). This, converted into the engineering standard, means that the figures given should be multiplied by 1.33 (approximately), the results then reading as follow:—Cast iron, 15 tons per sq. in.; semi-steel, 19 tons per sq. in. A totally different aspect, and one which the writer should have explained beforehand. The reasons for this explanation being omitted from the article were as follow. The figures were only given to show briefly the difference between a cast iron and semi-steel mixing from the physical standpoint. Secondly, the foundry in which the tests were made invariably uses the Admiralty test-bar, and the writer, although knowing that few foundries use this bar, unthinkingly forgot to convert the figures to standard practice. Perhaps my three critics will accept an apology for having deceived them.

The question of the percentage of steel in "semi-steel" mixtures is one demanding great attention. Nevertheless, if a man only adds 5 per cent. steel to his mixing, no one can prevent him calling it "semi-steel"—not until an actual standard is set. Perhaps we shall see such a standard set at some future date, but until then the producers of semi-steel are at a loss. In this direction the author is in entire agreement with the remarks contained in the leader.

"*Riley,*" *September* 11.—In this criticism it is stated that "15 per cent. steel is the minimum allowable to obtain the name 'semi-steel.'" The author is not aware that he gave a definite percentage of steel used in the mixing. It would be also interesting to know if there is a maximum percentage allowed and who has the authority to set these standards. We shall be getting a "semi-cast-iron" if we are not careful! As regards cost, the author is still unshaken in his statement. Figures do not generally lie, and what one foundry can do, so others should be able to emulate. Where foundries have been producing a low-grade cast iron, undoubtedly the cost of semi-steel will be more, but here again we come up against the steel percentage.

Your correspondent states that "*any* casting now produced in grey iron can be a better casting in semi-steel." Surely a somewhat wide statement to make and one which is open to controversy. Perhaps he will be kind enough to give his opinion and experience on semi-steel pipes as against those made in cast iron (treated purely from the foundry standpoint and not from a physical one).

Mr. John A. Smeeton, September 18.—In this criticism it is said that the correct term for "semi-steel" is "steel-mix iron." Surely we are getting to fine points when such statements are made. The author has seen hundreds of specifications where "semi-steel,"—per cent. steel content, is stated. Are all these specifications wrong and your contributor right? Technically he may be in order, but nevertheless it will take an earthquake to change the name of "semi-steel," and if the steel percentage is stated there is no misrepresentation whatever. In ninety-nine cases out of the hundred performance is what the customer wants. Technical matters are as nothing to him compared with performance and ability. Tables I and III in the article are of far more use in persuading a customer to place an order than, say, Table II. Let your contributor travel the country in search of orders and the correctness of this will very soon show itself.

Reference to the tensile strengths has, of course, been dealt with previously, and will not now seem quite so "ridiculous" as at first. In regard to the remark that "many of your readers rush into print without having read much of the valuable matter continually published by your excellent journal," it is apparent that Mr. Smeeton does not suffer from the inferiority complex. If it was, as he said, the standard of this journal would be considerably lowered, and instead of being excellent it would indeed become mediocre. Criticism must come to all of us, and without doubt it is the finest teacher in the world. But let it be fair criticism!

Conclusion.—It should be explained how the tensile figures previously given were arrived at. A transverse test was made with a 1-in. sq. bar at 11-in. centres (actually). The breaking load was 26½ cwts. From this the following formula (for cast iron) was used to convert to tensile strength: $W = 1.155\frac{bd^2s}{l}$ (given by the late D. N. Clark in his book "A Manual of Rules, Tables and Data for Mechanical Engineers," published by Blackie & Son); W = breaking load (in tons at centre); b = breadth of bar (in inches); d = depth of bar (in inches); l = actual span (in inches); s = ultimate tensile strength in tons per sq. in. Thus we get:—

$$1.35 = 1.155\frac{1 \times 1^2 \times s}{11} \therefore 1.35 = 1.155\frac{s}{11}$$

This gives s = approximately 14 tons per sq. in. The same procedure was adopted in the semi-steel calculations.

Since the article was published, however, actual tensile tests have been made with, if anything, slightly improved results.—Yours, etc.,

"Vallishe."

To the Editor of The Foundry Trade Journal.

Sir,—I wrote you my views on semi-steel in no spirit of controversy, but to call attention to certain proceedings being necessary to produce what I have been terming "semi-steel" for sixteen years.

Mr. Smeeton seems to think it necessary to be a metallurgist before having an opinion worth consideration. I am not in the habit of rushing into print, either with or without consideration of all factors connected with any subject, and claim to be able to figure a charge and to know what is required, to produce what my customers require. I certainly have no axe to grind.

I feel that the time has arrived when some body, such as the Institute of British Foundrymen, should enunciate a definite ruling as to what should constitute a suitable name for what I term "semi-steel," and to demand of that material a certain performance to be guaranteed by suppliers, then all founders start off one mark.

I do not claim any knowledge of either the Emmel or Perlit processes, excepting for articles in The Foundry Trade Journal, but I do know that semi-steel has done all I have asked it for. I think it possible that with either 60 or 80 per cent. steel in any cupola mixture, it will be necessary to say more than Perlit or Emmel to a shank of iron to make it run satisfactory in any but selected jobs.

I feel no desire to push any scheme entailing royalties or fees of any kind, nor do I feel strong enough to demand that semi-steel, or steel mixture, shall be the title of mixtures carrying over an agreed percentage of steel, but I feel that a decision should be arrived at, without it being necessary to point out that writers are too previous, and by analogy to suggest these writers do not know what they are writing about.

Here is the result of the last test we had taken of an Admiralty test-bar: Dia. of bar, 0.750 in.; tensile equal to 17.46 tons per sq. in.; transverse test on 1.02-in. × 1.04-in. bar on 12-in. centres, 1.56 tons tensile, equal to 3,220 lbs. per sq. in.

In your comments on my views, you say I arbitrarily fix a minimum, but what I said was that amongst practitioners, etc., 15 per cent. is the minimum.—Yours, etc.,

"Riley."

September 24, 1930.

Wanted, Small Continuous-Melting Unit.

To the Editor of The Foundry Trade Journal.

Sir,—I require a small quantity of molten cast iron daily to pour castings from $\frac{5}{16}$ to $\frac{1}{2}$ in. thick, and weighing from $\frac{3}{4}$ lb. to 4 lbs. maximum, to be easily machinable. Casting is to commence at 8 a.m. and, except for a break at noon, is to continue until approximately 5.30 p.m.

The metal will be used at the rate of about 6 to 7 cwts. per hour, equal to about 3 tons per day, the supply to be steady throughout and necessarily hot and fluid.

Probably the best method will be to melt the 3 tons quickly and collect in a separately-heated receiver, but I shall be glad if any of your readers can give me any information as to any such scheme in use.

Information or suggestions as to any other method of overcoming the difficulty will be much appreciated.—Yours, etc.,

Foundry Manager.

[This problem is not peculiar to the writer. Malleable-iron chain-casting makers obviously would welcome the solution.—Editor.]

Non-Rusting Steels.

To the Editor of The Foundry Trade Journal.

Sir,—In an article which appeared in The Foundry Trade Journal on September 12, 1929, I detailed my views as to the origin of the Krupp inventions in the field of non-rusting steels. Meanwhile, on the occasion of a visit to Messrs. Krupp at Essen, it has been proved to my satisfaction that the assumptions on which I had based my statements were erroneous, and that the inferences I drew from them are consequently unfounded. I therefore wish to correct my statements as published in The Foundry Trade Journal on September 12, 1929, and request that you will insert this statement in your journal. In accordance with the above, the action brought by Messrs. Krupp against me and others has resulted in judgment to the effect that the special type of chrome-cobalt steel for cutlery with a carbon content of about 1 per cent., to which reference was made in my article, is covered in Germany by the Krupp patents.—Yours, etc.,

P. R. Kuehnrich.

Holly Court, Sheffield.
September 10, 1930.

The Mystery of Cast Iron.

To the Editor of The Foundry Trade Journal.

Sir,—Having read the letter of Mr. Horace J. Young in your issue of September 25, and also the leader which provoked the said letter, I feel that I must express my agreement with Mr. Young's opinions.

The "inherent characteristic" catch phrase has become so popular when high prices have to be explained that it is refreshing to have such an able exponent as Mr. Young on the side of composition, which undoubtedly remains the safest criterion of the quality of a cast iron. The degree of superheat is the only factor which is likely to upset the interpretation of the usual form of analysis, and, as the range of superheat is so narrow in general cupola practice, this rarely occurs. It is understood, of course, that in visualising the structure the section of the casting and the character of the mould is known.

The concluding paragraph of Mr. Young's letter expresses very excellently the reason why cast iron is so often looked upon as an unknown quantity. That there is a certain amount of what might be termed mystery about the complex alloy, cast iron, cannot be denied, but the writer would respectfully suggest that the "psychology of pigs" is well outside the scope of iron-founding.—Yours, etc.,

W. E. Dennison.

13, Beresford Avenue, Newland, Hull.
September 27, 1930.

Ingot-Mould Manufacture.

To the Editor of The Foundry Trade Journal.

Sir,—In reference to the article, "The Manufacture of Cast Iron in the Electric Furnace," by Mr. Walter Lister, published in your issue of September 4, page 165, the author states that the failure of cast-iron ingot moulds is caused by "growth" of the iron, due to excessive graphitic carbon, and that therefore the carbon should be kept low. This is contrary to our own experience.

It is a speciality of our works to produce ingot moulds which are cast direct from a charcoal furnace. The iron shows as an average the following analysis: Total carbon, 4.2 to 4.7; silicon, 0.7 to 0.9; manganese, 1 to 1.2; sulphur, 0.02 per cent. max., and phosphorus, 0.15 to 0.25 per cent. max.

You will admit that this is an analysis which nobody would think suitable for ingot moulds. Yet we think that nobody could make better ones. Moulds of our make, and weighing 3 to 4 tons, last as an average 230 to 240 casts, and in isolated cases we have had over 400 casts.

It would be very interesting if Mr. Walter Lister could say what number of casts his moulds are standing up to, as this would show more than analyses and physical tests.—Yours, etc.,

Eisenwerk Sulzau-Werfen
(R. & E. Weinberger).

20, Schwindgasse, Vienna IV.
September 25, 1930.

The Late Mr. James Ellis.

(*Continued from next column.*)

ship of the past and mechanised conditions of to-day. His type of experience was invaluable, and is becoming ever more difficult to replace.

He leaves one son, Mr. J. Philip Ellis, who is on the laboratory staff of Messrs. J. Stone & Company, Limited, of Deptford, and two daughters, and to them, on behalf of his friends in the foundry industry, we offer our sincerest sympathy.

The funeral took place yesterday at Luton General Cemetery, when the Institute of British Foundrymen was represented by Mr. Tom Makemson, the general secretary, and The Foundry Trade Journal by the Editor, Mr. Vincent C. Faulkner. The principal mourners were Mr. J. P. Ellis (son) and the Misses Elsie and Marie Ellis (daughters).

The Late Mr. James Ellis.

We regret to announce the death, at the age of 70, of Mr. James Ellis, at his home, 20, Lambourn Road, Clapham, London, S.W.4, last Saturday.

Mr. Ellis was a founder of the Institute of British Foundrymen. He, through the correspondence column of The Foundry Trade Journal, created interest amongst its readers, with the result that eight enthusiasts met in 1904 in Birmingham and laid the foundation of one of the most successful and enterprising technical associations in the world.

Mr. Ellis was one of the old-time craftsmen. He was apprenticed in the shops of his uncle, where the blower for the cupola was operated by two men. He had a keen desire to know the why and wherefore of everything associated with foundry practice; his interest not only led him to form the Institute, but it was maintained until the end, for as late as last June he attended the Middlesbrough Convention. That his interest and support were appreciated by the Institute is shown by his election to the presi-

The Late Mr. J. Ellis.

A Founder, a Past-President (1916), and an Oliver Stubbs Medallist of the Institute of British Foundrymen.

dency in 1916 and the award of the Oliver Stubbs Medal only a few months ago. Mr. Ellis's career can be divided into four main sections. From 1900 to 1910 he was engaged as foundry manager to Donkins, at the period when they removed from London to Chesterfield. Then he spent another ten years with Thornycrofts at Southampton, whilst a third period was spent with George Kent, of Luton. In recent years Mr. Ellis, who was handicapped a little through deafness, has been in charge of the research and development department of Messrs. William Cummings & Company, Limited, of Glasgow and elsewhere, a position he much appreciated, as it allowed him to pass on to others the benefit of his long practical experience. It is characteristic of the old-time craftsmen that they love to teach the younger generation. "Jimmy," as he was almost universally known, was never so happy as when lecturing to the junior sections of the Institute.

The passing of Mr. Ellis means a further severing of the link between the real craftsman-

(*Continued on previous column.*)

Random Shots.

With reference to the Liverpool & Manchester Railway centenary celebrations, the Stockton & Darlington was the first public railway to use locomotives, and the first deliberately constructed to use them, but for a number of years passengers were drawn by horses in stage-coach bodies on railway wheels. The stage-coach body survives to-day in the ordinary railway compartment. The Liverpool & Manchester, now the L.M.S., line between the two cities was, perhaps, the first real railway in the world.

* * *

In 1825 many mines and collieries had railways, the motive power being furnished either by horses, by gravity inclines (for down-hill loads), by stationary engines and rope haulage, or by locomotives. At least thirty locomotives had been built for railway work in England; two, which would not go, in Germany, and a model in the United States. Eighteen of the English 30 were doing useful work in 1825, but their future was precarious. Except Stephenson, no one had built a locomotive since 1814.

* * *

Stephenson was appointed Chief Engineer to the line after the preliminaries had been settled. His success in taking the line over Chat Moss is well known, but the opposition had compelled alterations to the original plan, which introduced many engineering difficulties. The directors were divided between the use of locomotives and stationary engines and were more than three years coming to a decision. Ultimately they offered a prize of £500 for the best locomotive, and ultimately the famous Rainhill trials were the outcome. Five locomotives faced the starter, and only the Rocket stayed the course, and the stationary engines thought essential for dealing with the inclines at Whiston and Sutton were found to be unnecessary.

* * *

On September 15, 1830, the line was opened, with eight trains, and the tragic death of William Huskisson, who was knocked down by the Rocket, is a matter of history.

* * *

Much the most attractive thing about a cocktail is its name. Who could resist the lure of a Purple Glory, or the enchantment of an Angel's Kiss? They make mere side-cars or bacardi seem tame by comparison. Proprietors of toilet soaps and other commodities might get a few tips as to names from the recent cocktail competition.

* * *

I was discussing things in general the other day with one of the many business men who have recently visited the United States. The funniest sight in that land of plenty, he declared, was in the east-side district of one of the industrial towns. A queue of disreputable looking hoboes lined up outside a corner shop labelled "Barber's College." It worked on the principle that students desiring to learn hairdressing and shaving paid good money to learn. They practised on the aforesaid men, who got a shave or a haircut for nothing.

* * *

Here, surely, is a chance for the foundry trade! Why not meet competition by selling castings made by enthusiastic learners from the other depressed industries (such as musicians hit by the talkies), and who pay a premium for the privilege? Or why not open a store in which goods are handed free of charge across the counter by shop assistants in training? It sounds too good to be true. After a time you would probably only make ends meet by a close shave.

* * *

Since the advent of midget golf, the Engineers' Club, like this column, is now devoted to Random Shots.

Marksman.

Foundry Rationalisation.

ITS SUCCESSES AND FAILURES.

The London Branch of the Institute of British Foundrymen held the first meeting of its 1930-31 session in the private theatre of Edibell Sound Film Apparatus, Limited, 89-91, Wardour Street, London, W.1, on Thursday, September 18, 1930, when a very large number of members attended to hear Mr. A. F. Gibbs, the new Branch-President, deliver his Presidential Address. Mr. Gibbs has recently recovered from a somewhat lengthy illness, and Mr. J. W. Gardom (the immediate Past-President of the Branch) voiced, on behalf of the members generally, their pleasure in welcoming him back amongst them and their wish that he would continue to enjoy good health in the future.

Presentation of Diploma.

Mr. J. W. Gardom (who presided during the early part of the meeting) formally presented the Institute's Diploma to Mr. C. H. Kain (a member of the Branch). The award was made in respect of a Paper presented by him to the Branch during the previous session, entitled "Steel Castings."

PRESIDENTIAL ADDRESS.

Mr. A. F. Gibbs, in his Presidential Address, said:—

Mr. Gardom and Gentlemen,—I am deeply appreciative to you all for the great honour you have conferred upon me by electing me your President, and I shall do my utmost to see that this confidence has not been misplaced. I do hope that my year of office will be associated with one of great progress to the Institute, and more especially may this apply to the London section, not merely because I am its President, but, chiefly, because next year we anticipate having Mr. Dews as our President. Mr. Dews is, as you know, an eminent metallurgist who is known internationally throughout the foundry industry. To me it is a matter of concern that I should occupy this position of honour the year before Mr. Dews. I can only liken this to an example of the best wine reserved until later. Thus, gentlemen, we must make every effort to maintain the section worthy of its past and future Presidents; with a united effort this can be done. Especially do I want this section not only to increase numerically, but to be instrumental in helping one another.

In these days of amalgamation and central-control, hardly one of us can say definitely that his position is secure for life. It is in cases where members become displaced that the Institute should strive to do its utmost in helping them to another position. In respect to the first point, the Council has agreed that each member present as he leaves this hall will have handed to him a nomination form for a new member, and I am sure you will all do your utmost to see that the form is handed to a non-member. But whether you can induce anyone into joining or not, it is essential that we should co-operate. With regard to the second point, I know that the General Council is dealing with this matter, but the local council would like any member who is displaced to write to the Secretary informing him of the fact; so that if any of us should know of any vacancies available, introduction can be effected.

Rationalisation.

To-night I have chosen for my subject "Rationalisation as applicable to the Foundry Industry." Those of you who have read the President's address at Middlesbrough may have noticed that one paragraph starts with "Rationalisation" (that blessed word whose definition or meaning is so difficult to define). Rationalisation to-day means so many things, which only a few years ago positively were anathema to the British ear. To-day it covers amalgamations, trustifications, chain-shop processes, multiple shops, standardisation and re-organisation of all industry. It stands for elimination of all waste and the encouragement of production in the most scientific and up-to-date manner.

Above all this, it should stand for restriction of output, always bearing in mind the welfare of the consumer as well as of the producer. I am not so sure, however, that rationalisation can be defined quite like the following anecdote. A man met a workman running, and in answer to his query as to where he was going, he received the following reply: "To the undertakers. We have had an accident at our place." "Surely you mean the doctor?" "No," replied the workman, "the undertaker. We're rationalised, and have cut out the middleman!" But to come down to rock bottom; does rationalisation confer a blessing or deserve a "cussing"? I am sure that a case can be made out for both. Undoubtedly when it means the displacing and dismissal of men by the introduction of up-to-date and speedy machinery it is a curse. The worker who is dismissed does not at least bless this cult. But these unkind actions have to be done, unless we are content gradually to lag behind and become a third-rate nation.

Ameliorative Measures.

The idealist and the dreamer may insist that all these new inventions should be used to ease the lot of the worker. Yes, perhaps, rightly so, they should, but who is to say that we in this country must do this whilst our foreign competitors capture the world's markets by utilising the capabilities of machinery for increasing and cheapening all forms of production? The millennium has not yet arrived, and when I see what a task our national representatives at the International Labour Conference, held at Geneva, had in trying to have established a maximum working-hour day for all industrial workers, I postulate with every confidence that rationalisation must go on. To the employer and the employee I would advise the adoption of rationalisation in all its varied intricacies. Otherwise you and your firm are going to drop out of the race. Much as I deplore it, I realise that we are fighting for our very existence. The whole world to-day is becoming mechanised, and it is something we must approach with determination, caution and foresight

Here are the words of Mr. Baldwin in a survey of modern industrial problems. He said: "The adjustment of mankind to the machine is the biggest problem that humanity is up against, and I cannot prophesy what the end is going to be." There are some in our midst who imagine that a system of high tariff walls would save the situation; others insist that trade within the Empire is the essential factor. They suggest that the Dominions will take all our manufactured articles, whilst they in return will remain non-industrial communities. This I am sure is a fallacy. How can we of the foundry world believe that Australia, Canada, Africa, or India will always be content to buy manufactured articles from us, after reading as we do in The Foundry Trade Journal (*vide* the issue of August 28) in an article by Mr. D. Clark showing how Australia is forging ahead in the manufacture of steel and iron castings?

And we know that Canada, Africa and India are just as progressive. Certainly some tariff wall against goods produced abroad by cheap labour and State subsidy may be most desirable to protect home industries against any unequal competition.

Results Achieved.

This is supposed to be a problem for the politicians, but I really think it is a job for business men, who eventually will have to take over this political evergreen and tackle the whole question from an international business man's point of view. But for the present let us all, whether employer or employee, do our utmost to forge ahead in this race for supremacy. Let us all regard rationalisation as something that will improve industry and keep the workshops employed on full time. Possibly we may even then be able to require those who have been dismissed, and finally be in a position similar to the following case in Germany. The German steel combine found that the result of rationalisation after two years had been to increase the workers by 4 to 8 per cent., to decrease the clerks by 2 per cent., and to decrease the directors by 26 per cent. Now with this in our mind's eye let us ask ourselves what we have to do, to bring about so desirable a state of affairs. Not only must we encourage the introduction of up-to-date machinery, consistent with modern needs, but the administration or management must be in the hands of intelligent and enlightened executives, men who have tried to rationalise themselves.

This self-rationalisation cannot be better carried out than by reading current scientific and practical Papers; attending classes whilst young, and by becoming active members of an institute, such as we here to-night are truly representative. This Institute, by means of organised visits to modern foundries, both at home and abroad; its exchange of technical and practical Papers with other countries, and finally its official organ, The Foundry Trade Journal, gives all its members the opportunity to become and to keep thoroughly rationalised. To the employers I would say, get together and form a combination of all the firms doing similar work, but make such arrangements which will still leave freedom for initiative on the part of the separate firms, and at the same time give unlimited opportunities for mutual help. Thus, one firm may very possibly be far ahead in technical efficiency, whilst at the same time its practical operations may not be so advanced as its former rivals. This did occur in the German foundries, and, as explained by Dr. Werner, considerable economies did mature owing to some form of amalgamation with its opportunities for making comparisons.

To-day, in this country, we have an example of amalgamations in the grouping of the railways. Here rationalisation, viz., standardisation, reorganisation, and the introduction of up-to-date machinery, has already effected considerable economies. Thus Sir Josiah Stamp, in his address to the L.M.S. shareholders, told how, with a particular type of engine wanting heavy repairs, that, in 1920, the time taken was 10 to 12 weeks; in 1925, 5½ weeks; in 1927, 2 weeks; and in 1930, 47 hours. It is interesting to note that the statistics of March last showing people employed on the railways were 656,530, against 642,137 the previous year. But even here amongst the railways, with which I am proud to be associated, I venture to say that, so far as the foundries are concerned, we have not yet reaped those rich rewards so ably described by Dr. Werner. Rome was not built in a day, and I am sure that those in the foundries associated with the railways have yet to see the full fruits of amalgamations. Incidentally, surely the time is now opportune for the railway management and equally so the private employer no longer to look with complacent eye on the foundry lads who attend classes or otherwise, or who join associations such as ours which are the sources of inestimable benefit to all in the foundry industry.

While appreciating the facilities offered by the railway companies in connection with their own mechanics' institutes, and as an old scholar I am indebted to them for having given me opportunities for obtaining an excellent groundwork

in mathematics and machine construction and drawing, I would ask why the railways cannot do something more direct for the foundry lad and the industry he represents. And in passing may I ask, if it is not too pertinent a question, have the railways been asked by the Institute's Educational Sub-Committee to collaborate in the proposed scheme for the education of the foundry worker, when one realises that the railways in this country to-day have a shop and artisan staff (excluding labourers) of 110,385? Unfortunately I am not able to give you the figures of foundry employees, but at least, as a guess, I would say that the railways of this country have in active operation round about 40 foundries. Surely then the railways who do cater for the education of their employees ought to be asked to participate in the work of this Committee. But referring back to the apprentice, the moulder, or the foreman, who attend classes or join associations such as the Institute of Metals or our own Institute, I insist that these efforts for self improvement, this reaching out for a fuller and more comprehensive knowledge of their trade or industry, is to my mind the ideal personal rationalisation.

Value of Horizontal Trusts.

On the question of the amalgamation of private firms, I do not propose to say to-night whether amalgamations should be restricted to what is known as the horizontal trustification or radiate out further and embrace what is known as the vertical amalgamation, which, by the way, is usually adopted in the iron and steel trades; but I will express the view that I think, first of all, it would be advisable to try the simpler method known as the horizontal by means of amalgamation of firms doing similar work. This amalgamation will undoubtedly lead to Cartels being introduced, so that over-production, which floods the market and brings down prices, will be avoided. Undoubtedly this will call for a very large amount of loyalty and mutual trust. Rules will have to be framed, and some strong association formed to enforce them. Unfortunately in this country the Law Courts would not consider these rules binding. In Germany, however, the legality of similar rules is recognised. Again you see the necessity of business men to make laws suitable for a business world. But undoubtedly, under either vertical or horizontal expansions, considerable economies can be effected. This union or amalgamation of firms would make possible a number of commercial and administrative economies. Buying departments and staffs can be united, bulk purchases made, and material standardised. On the marketing side there can be economies effected in the selling staff and agencies, and advertising can be made more effective by concentration into the hands of a single manager. Often financial strength is increased. Gains are possible on the production side, data can be interchanged, such as methods of sand treatment, core making, moulding, fettling and foundry transport.

One of the many meanings of the word "rationalisation" refers to the attempt to realise more fully the productive economies of large-scale management, and to combine them with the logical application of large-scale production. The rationalisation programme implies that all the plants manufacturing a certain range of products shall be brought under single control, smaller and less efficient works closed, and the entire production concentrated in a few large works, each specialised for producing a very limited range of articles. This programme of organisation is to be accompanied by devices designed to secure stability, such as price-fixing arrangements and the like. But against this theory one can place many arguments, thus is there not an optimum size where the limits of profitability and human control is reached. Lord Melchett did say, in the days before he started rationalising activities, that "It was quite impossible for human beings to control any industry beyond a certain magnitude." But even this view does not take into account that large scale control depends chiefly on methods of administration. These methods are just as much the subject of invention as technical methods of production, and the industrial revolution consisted no less in the development of factory administration organisation than in the elaboration of new machine technique. For instance, Boulton's claim to fame rests, not only on his association with Watt as the manufacturer of steam engines, but on his administrative capacity. He it was who first practised division of labour in 1770, specialising his men to particular tasks, arranged weekly meetings of partners and managers to discuss price lists, sales, etc., and he also developed systems of book-keeping.

The Alternative.

In respect to those members who, like myself, are foundry managers or in any similar position of control, I take the liberty of saying that you should do all you can to modernise your foundry. It is your duty not only to your employers, but to your industry, and to the men in the shop. In your love of craftsmanship—and craftsmanship in the industry is, I think, something not appreciated as it should be (at least, not from a monetary point of view)—may I point out to those with feelings like this, that though they are sentiments to be proud of, if you refuse to advance with the times, then, in my opinion, you are placing yourself, your shop and your firm in great danger of being run off the market as a competitor, and thus you will be helping to create a worse state of affairs than rationalisation.

In respect to what I have already mentioned in regard to combination or amalgamation, may I put before you the following details which I think point to some need of rationalising output. To-day it is admitted that we are faced with gluts of coal, cotton, wheat, woollen goods, rubber and ships. In fact, the cry is not that the workers have not produced enough, but rather, owing to the use of modern methods, over-production is rampant. For instance, in shipbuilding it is published that the output of new ships in this country from 1922 to 1928 increased from one million to one million five hundred thousand tons, with eighty-nine thousand less workers employed. And undoubtedly the same conditions will apply to our own industry. As to how this is going to finish one cannot say, but undoubtedly it will call for the highest statesmanship. I at least do think that if we as a nation, and more especially as an industry, keep on the track of modern technique and up-to-date reorganisation, that we shall be able to obtain our fair share of the world's trade. I cannot finish this address without saying that I do hope either a foundry owners' association or the Government will see that no moulder or foundry operator is allowed to be thrown out on to the street (due to rationalisation) after a lifetime of usefulness without adequate pension or compensation. It makes me feel very sad when I read of cases where men of 20 to 30 years' service with one firm have been thrown on the scrap heap immediately on amalgamations taking place. I do ask, if any of our members have some influence with the amalgamating firms or with any public body, that they will do their utmost to assist loyal men who have of necessity been displaced. Finally we know that rationalisation will put us on our mettle. May we all have as apt a reply as the foreign agent who was cabled to by his firm in the following manner:—"Move heaven and earth, secure railway contract." The representative replied:—"Heaven and earth not available. Raising hell, prospects good."

Vote of Thanks.

Mr. H. C. Dews (Senior Vice-President of the Branch) occupied the chair during the latter part of the meeting.

Mr. W. B. Lake (hon. treasurer of the Institute and a Past-President of the Branch) proposed a hearty vote of thanks to the Branch-President for his address, and said he was honoured in being allowed to do so. In the first place, he commented upon the fact that so large a number of members had attended the meeting, and regarded that circumstance not only as a very happy augury of a successful session, but also as a great tribute to the new Branch-President.

Problem of Over-Production.

Had he been allowed to discuss the address, he continued, he would have said that there were statements in it with which he did not quite agree, but, at the same time, there were a great many more statements with which he was in hearty agreement. The Branch-President must have devoted a great deal of time and study to the preparation of the address. In common with the Branch-President, all the members must feel some anxiety as to where rationalisation was really leading us. There was a surplus of practically every manufactured article in the world, and at the same time there was a lamentable lack of employment. It would appear that, unless demands could be increased very greatly, half the world would have to work and keep the remainder doing nothing, and then the question would arise as to whether the economies effected by rationalisation would more than outweigh the large expenditure which would have to be made in order to maintain those who had been displaced. The problem was a most serious one, well worthy of the most profound thought on the part of our statesmen; if they would look at it with eyes clear of politics, with a view simply to helping, understanding and remedying this very strange and novel state of affairs, their time would be well spent.

Finally, Mr. Lake assured the Branch-President of the hearty support of all the members of the Branch during his year of office, and expressed the hope that the year would be one of useful work, upon which he would look back, in the future, with great pleasure.

Mr. H. G. Sommerfield (Junior Vice-President of the Branch), in seconding the vote of thanks, said whenever the shadow of an incoming president was cast against the chair it was always a matter of conjecture what he would take as a subject for his presidential address. He complimented the new Branch-President upon his pluck in endeavouring to pilot a skilful line of thought over the shoals of so difficult a subject as rationalisation. The Branch-President had given the members a basis for a first-class fiscal debate, but a presidential address was above debate. The subject was uppermost in the minds of all, yet because they were courteous and were in dignified society they would refrain from debating it. (Laughter.) Mr. Sommerfield said he admired the speaker's pertinent questions to administrations, his pointed thrusts at industry as well as the pious hope he had expressed to the Government of the day. In the early part of his address the Branch-President had set up an ideal for the Branch and for the Institute as a whole—the ideal of giving a helping hand to everyone who needed it in the Institute. That came very near to the fundamental purpose of the Institute—"Science hand-in-hand with Labour"—and it was hoped that during his year of office the Branch-President would see that spirit more firmly established—in fact, permeating the whole Institute.

Railway Rationalisation.

Mr. Wesley Lambert, as a Past-President of the Institute, and particularly as a Member of the London Branch, congratulated the Branch-President on his address, and also upon the courage he had shown in selecting "Rationalisation" as the subject-matter of his presidential address. The Branch-President's pluck was particularly commendable, said Mr. Lambert, inasmuch as it has been stated in some quarters that there is not a single railway company in the kingdom running a foundry on economic

commercial lines. (Laughter.) This being so, and should rationalisation be generally adopted throughout Great Britain, the railway foundries would either be forced to come into line with commercial establishments or be swept away, in which latter case the Branch-President, as a railway foundry manager, might find himself in a very bad way. Mr. Lambert agreed that in future this country would have to meet considerable competition so far as overseas trade was concerned. As an indication of the difficulties to be faced, he had been told only a day or two ago that no less than £5,000,000 had been subscribed to finance a local steel-making establishment in South Africa. In this connection, he understood from his informant that notwithstanding that fuel has to be transported by rail for a considerable distance—and here the eternal question of railway freights came in—excellent coal was being delivered at this works at 4s. 3d. to 5s. 10d. per ton, including freightage. His informant further stated that whole mountains of really good hematite iron ore were awaiting development in that country. Those who know anything about iron know that if large quantities of good hematite iron ore are available, as also an adequate supply of coal at the price previously mentioned, a condition exists very favourable to the determination of the future policy with regard to steel manufacture in a country such as South Africa.

Industrial Developments Abroad.

With regard to other countries, India was now able to send pig-iron to Great Britain and sell at a price lower than it can be purchased from home manufacturers. Japan, a country to which we supplied very large quantities of material twenty or thirty years ago, is paying great attention to the resources of that country, and is now able to manufacture and even to export in large quantities the material previously imported. Financiers and manufacturers in the Argentine, to his own knowledge, were also looking around and were hoping that in the near future large steelworks, rolling-mills, and other big manufacturing industries will be built up in that country in the immediate future. Australia has already established big industrial works, and, he understood, was desirous of erecting tariff walls, so that its own manufacturers should have preferential treatment over those of other countries. Although not a pessimist, he recognised that we in this country must face facts, and one of these facts was that it is becoming increasingly difficult to maintain the extensive overseas trade which we have been fortunate enough to enjoy for so many years. It behoves us, therefore, to put our manufacturing concerns in order and to endeavour to effect economy in production in every direction. Whether rationalisation, as at present understood, will be the basis of our success in the future, he was not in a position to say. He had gathered from recent conversations with representatives of steel manufacturers throughout the country that a number of firms were to-day suffering very materially from the immature attempts which had been made to introduce so-called rationalisation; attempts which had placed many companies in a position of such uncertainty of procedure that they did not know how they stood. Whether or no the schemes which have been prepared would frutify and benefit the steel trade in the near future he of course could not say. He had very little confidence in politicians, and he doubted whether the best economic propositions with respect to the reconditioning of industry would result from the efforts of the politicians. What benefits are to be derived, he thought, would be the outcome of the endeavours of technicians rather than politicians.

Dealing with the Branch-President's question as to whether the Institute of British Foundrymen had approached the railway companies with a view to securing their co-operation in connection with the scheme for the training of foundry apprentices, Mr. Lambert said that at the moment he could not answer in the affirmative, but as a member of the Committee appointed by the Institute to deal with such training, he would make a point of raising the matter at the next meeting of the Committee. If, as had been stated by the President, there were forty railway foundries in Great Britain, the assistance of the companies should certainly be sought, commanding, as they do, large financial interests.

Supporting the vote of thanks, he (Mr. Lambert) again congratulated the Branch-President, and said it was very refreshing to have from a President of a Branch of the Institute an address of the character Mr. Gibbs had given.

Failure of Rationalisation in Germany.

Mr. V. C. Faulkner (Past-President of the Institute and of the London Branch) said it was particularly interesting to him that the subject of rationalisation should have been chosen for the presidential address, because only that week, in his capacity as Editor of The Foundry Trade Journal, he had been handling "copy" emanating from the sixtieth annual general meeting of the German Iron Foundry Owners' Federation, and in it there was a definite confession of the failure of rationalisation. Dr. Geilenkirchen, the Director of that Federation, had ascribed that failure to two causes—firstly, that they had borrowed money from abroad at too high a rate of interest, and secondly, that the whole of the benefits they had hoped to achieve had been discounted by the extra demands for money on the part of the operatives. Mr. Faulkner deemed that those two factors should have been considered before the attempt to rationalise was made, because they were definitely part and parcel of any true rationalisation scheme. The factor which exercised his mind more than any other in regard to this problem was that mentioned by Mr. Lake, that what was gained by rationalisation was lost on the social side in having to pay out so much money for the maintenance of the men displaced from the rationalised undertakings. Examination of the figures concerning exports of castings from Great Britain during the first eight months of this year showed that, unlike most other industries, the foundry export business had dropped by only about 7 per cent.; that was microscopic as compared with the decrease in the textile and other industries. "Rationalisation" was a very much misunderstood word, and it must affect every factory, but most individuals were looking at it from the point of view of its effect upon their own particular position. It affected the employer, who had to consider whether he should combine his undertaking with another horizontally or vertically; the manager, as to whether he could introduce further labour-aiding machines; the foreman, as to whether he was going to effect increased internal economies. It must be considered, however, from the point of view of the combined interests of all, and it was better to deal with the matter through the scientific societies than through any other media, because within the scientific societies one met all the various interests which were influencing and were influenced by these movements.

Mr. G. C. Pierce (Past-Branch-President), who also congratulated the Branch-President upon his pluck in discussing the subject of rationalisation and upon having, so far, "got away with it," suggested that it would be helpful, in considering present-day difficulties, to recall some of the happenings of the last ten years. About ten years ago, or less, everybody had been crying out for increased production, and it was said that we were going to secure the world's markets and that everybody would be better off. That increased production had been effected, but it did not appear that we were much better off. As he had stated during his own year of office as Branch-President, even Mr. Henry Ford, with his great organisation and his great influence, could not prevent unemployment.

Mr. J. Bartram, as a colleague of the Branch-President, assured him how much his address had been appreciated. With regard to the British railways, he assured Mr. Lambert that they were setting a good example in the manner in which they were looking after the boys, and in this connection he mentioned the case of one lad who, having attended classes, had been given the opportunity for gaining experience and knowledge in the pattern shop for a good time and had since been given part-time in the chemical laboratory. Any lad who entered the railway service, and who cared to study, would receive the same treatment, he believed. So far as he could see, the various managers were quite prepared to help the young men along if those young men would help themselves, but a great many would not take the trouble, however much one tried to influence them.

The vote of thanks to the Branch-President for his address was accorded with acclamation.

The Branch-President thanked the members for the manner in which they had received the address, and for having attended in such large numbers. Commenting upon the congratulations extended to him for his pluck in dealing with so difficult a subject, he recalled the words of the poet, Pope, that "Fools rush in where angels fear to tread," and said that perhaps that applied in this case. The subject, of course, was one upon which hardly any two persons would agree. He would have liked to have said a word or two to Mr. Lambert, but it was not within his province to pat his colleagues or himself on the backs, and therefore he would leave the matter as it stood, except to point out that Mr. Lambert had substantiated the statement made in the course of the address, to the effect that the railways had not yet reaped the full fruits of their amalgamation.

Falkirk Welfare Club.

Captain H. J. Kennard, R.N., managing director of the Falkirk Iron Company, presided at the opening meeting of the company's Welfare Club last Thursday, September 25. The chairman was supported by Judge Muirhead, the welfare supervisor, Mr. Robert Wilson, secretary, and Mr. George Scotland, one of the firm's directors.

The Chairman extended a cordial welcome to those present, and said that if, in industry, they were not at the moment living in very happy times, he felt certain that they hoped for better conditions. He did not know whether they were actually in sight, but they would trust that their advent was not far distant. The speaker referred at length to the activities of the various sports clubs run in connection with the welfare department. He stated that an excellent programme had been arranged for the winter session, and they were fortunate in having so enthusiastic and efficient a committee.

An entertainment was later given by the Lyric Concert party from Grangemouth.

An Interesting Competition.

The Bureau International de l'Aluminium, of 23, bis-Rue de Balzac, Paris VIII, is offering £800 in prizes for suggestions which will result in an increased consumption of aluminium. Details of this competition are outlined in the advertisement pages.

For grinding chromium plate, use a wheel speed of 4,800 f.p.m., a work speed of 25 to 40 f.p.m., and plain water as a coolant.

Manufacture of Hack Saws and their Use in Hack-Saw Machines.

HOW TO SECURE MAXIMUM EFFICIENCY.

On a recent visit to the Composite Steel Works, Sheffield, of James Neill & Company (Sheffield), Limited, our representative was given an opportunity of inspecting the hack-saw blade department. This department was initiated in 1912, when it was thought that the space allocated would easily meet all possible developments for many years. The shops have been responsible for a considerable time for a production well in excess of their designed capacity, and operations have of necessity become congested.

Fig. 1.—Casting Crucible Steel.

Fig. 2.—View in Chemical Laboratory.

To meet the demand for space, a large block of adjoining property has been demolished, and as soon as the site is cleared a factory of two storeys will be erected for the hack-saw department. This will relieve the pressure in various other branches, such as razor blades, permanent magnets, composite steel, iron, etc.

Messrs. Neill & Company possess the great advantage of controlling the production of their hack-saw blades from the melting of the raw material. The essential qualities of hack-saw blades are, of course, great hardness combined with toughness. Crucible tungsten-alloy steel, which has proved to be the most suitable, is exclusively employed for the manufacture of "Eclipse" blades. "Eclipse" blades are now also being manufactured extensively from high-speed steel. The manufacture of the latter is on similar lines to that of ordinary 1 to 2 per cent. tungsten-steel blades, but the heat treatment of the blades made from high-speed steel is different. In addition these blades are finally sand-blasted, and the finished blades possess a very attractive silvery appearance. The high-speed steel blades cost 3½ to 4 times as much as "Eclipse" 1-2 per cent. tungsten steel blades, but they will accomplish at least 6 times more work, and in addition will cut hard steels approximately twice as quickly. They are specially suitable for cutting hard alloy steels. Every ingot from which "Eclipse" blades are made is analysed in the works laboratory and subsequently classified before being rolled into sheets.

Manufacturing Process.

The manufacturing process may briefly be described as follows:—

The ingots are rolled into sheet form about 20 in. wide and approximately 6 ft. long, in the various gauges required, and then cut up under guillotine shears into the necessary widths and lengths for the various sizes of blades required.

The strips are then clamped together forming a solid block, and the teeth are milled out by Lincoln-type milling machines, specially designed and constructed for this important process. The milled strips are next put through automatic setting machines of most ingenious construction, to give the teeth sufficient clearance to enable each tooth to do its full share of cutting.

The next process, which is carried out in

Fig. 3.—Shears Department.

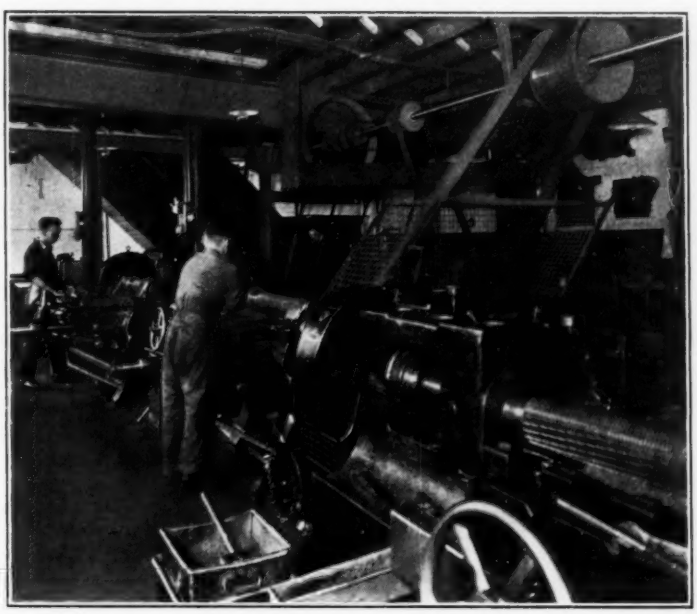


Fig. 4.—Milling Shop.

specially-designed heavy presses, blanks the strip into two blades, rounds the ends, punches the holes, and brands the blades with the "Eclipse" trade mark in one operation.

Heat Treatment.

Upon the efficiency of the heat treatment depends the life of the blade. Naturally, therefore, the heat-treatment furnaces of the most modern type are controlled within the narrowest limits as regards temperature. Automatic bells further control the human element and fix for the operator the exact length of time the blades are in the furnace. In this way the period of "soak" can be definitely fixed for each size of blade. For hardening, the blades are raised to a temperature of approximately 780 deg. C. and quenched in pure sperm oil. A temperature of 375 to 450 deg. Fah. is required for tempering varying according to the size of the blade. The process is carried out in a specially-constructed gas-fired muffle furnace.

Finally the blades are softened at the ends by passing them on an endless belt over a series of burners. This operation is necessary to prevent the blades breaking through the holes when tensioned in the frame. Besides the "All-Hard" blade, an "Eclipse" flexible blade is made which is unbreakable in use, and is to be recommended where semi-skilled labour is employed or where the work is in a difficult position or cannot be held in a vice. These blades are only hardened on the teeth, the backs being left soft. To harden these blades they are passed down between two jets, which play on the teeth, the blades then passing into a tank of pure sperm oil to be quenched.

All the finished blades are delivered to the warehouse, where they are carefully inspected, bundled into dozens and boxed.

Efficiency in Manufacture.

Few engineering firms have devoted the same attention to hack-saw cutting which this firm give to reducing production costs on all other machine-tool work. Drilling and milling machines, lathes, automatics, etc., are kept up to the highest degree of efficiency, and output is costed to a decimal. With hack-saw cutting, however, the tendency is to overlook the production and upkeep costs and to assume that these charges will be covered by the standing charges. Collieries and iron and steel works are amongst the largest users of hack saws. The cost of the blade is a trifling matter, and in the aggregate will not form a serious item in the stores accounts, but by the improper use of the hack-saw blade, the power costs, not to mention the time factor, can be very seriously affected.

When showing our representative through the works, Mr. F. A. Neill was responsible for exceedingly interesting and pertinent observations upon the use and abuse of the hack saw. A summary of his views will, we think, be helpful.

Mr. Neill pointed out that in the majority of shops the hack-saw machine is not treated as a machine tool; it is relegated to some out-of-the-way corner, where the light is far from good, and subsequently it gets little if any skilled maintenance service. Under such conditions it has small chance of functioning at maximum efficiency.

Heavy Power Cutting.

There are three types of hack-saw machines in common use, viz.:—

(1) The old-fashioned "rub up and down" machine, with no lift on the return stroke. The blade cutting on the forward stroke and rubbing on the return stroke.

(2) The oil dash-pot type of machine which holds the blade off the work on the return stroke until the commencement of the forward or cutting stroke.

(3) The oil-ram positive-lift type of machine built on the draw-cut principle, which definitely lifts the blade clear of the work on the forward or non-cutting stroke.

The first type of machine requires a blade having a finer pitch of tooth than the other two, owing to the fact that the machine does not lift on the return stroke. This is a very serious handicap, for no blade can be expected to give first-class cutting results when the return stroke dulls the teeth, especially as the majority of such machines are not fitted with any arrangement for supplying coolant to the blade. On no account should the speed of these machines exceed 60 strokes per min., as a greater speed would draw the temper of the blade. It is also important to see that the slides and bearings are kept in perfect condition. All wear between the slides and the frame should be frequently tested and any undue slackness taken up.

With the other two modern types of hack-saw

Fig. 5.—Teeth-Setting Department.

Fig. 6.—End-Tempering Shop.

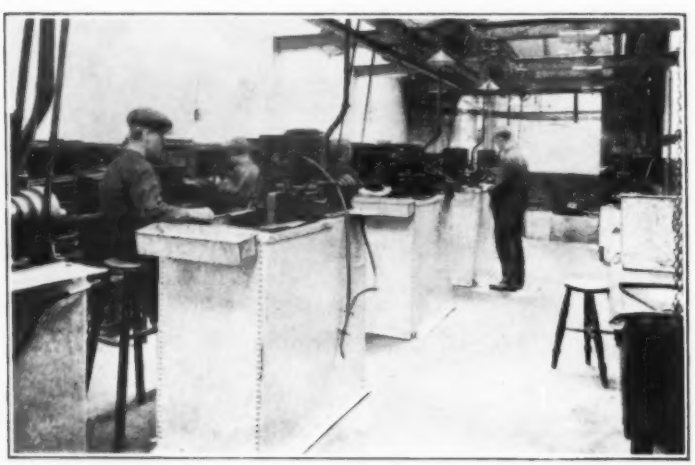


Fig. 7.—Hardening Shop.

Fig. 8.—Inspection and Packing Department.

machines it is essential, if the best results are to be obtained, to ensure that the lifting mechanism is functioning properly, particularly the timing, and that there is no play in the shaft bearings or the connecting rod, further that the slides fit the frame properly and are regularly re-adjusted to give perfect smoothness on the cutting stroke.

The lifting mechanism, which releases the pressure on the return stroke, must be regularly attended to and cleaned out. It is also important to see that the blade is cooled by a regular flow of coolant, and that this does not enter the relief mechanism in machines of the "dash-pot" type. The speed of these modern machines should be anything from 60 to 70 strokes per min. when cutting hard materials, and on milder materials 110 to 125 strokes per min.

TABLE I.—*Showing Correct Pitch of Teeth.*

Material to be cut.	Hand.	Light power.	Heavy power.
Cast iron, bronze, aluminium	14	14	4 or 6
General work on mild steel in rounds, flats and squares	18	14	6
Medium and hard tool steels	18	14	10
Angle iron, brass, copper, iron piping, etc. ..	22	18	14
Conduit, cycle and other thin tubing	32	22	14

If there is any weight on the machine, it should be taken off as soon as a new blade is put in, and the pressure only increased as the blade commences to lose time. It should also be remembered that certain machines are built on the draw-cut principle, and on these it is important to see that the blade is put in with the teeth pointing in the right direction.

Care must be taken to clamp the material firmly in the vice and in tensioning the blade in the machine. The coolant used should not be of a greasy or oily nature, as this allows the blade to slide over the work instead of cutting into it, and the teeth glaze and become blunt. The following mixture is recommended:—1 gall. of water, 1 lb. of washing soda, and a very small quantity of soluble oil.

TABLE II.—*Pitch Relative to Cutting Surface.*

Light power blades.	Heavy power blades.
Where the cutting surface is :—	Where the cutting surface is :—
$\frac{1}{16}$–$\frac{1}{4}$ in. use 32 teeth.	$\frac{1}{2}$–$\frac{3}{4}$ in. use 18 teeth.
$\frac{5}{16}$–$\frac{1}{2}$ in. „ 22 „	$\frac{1}{4}$–1$\frac{1}{2}$ in. „ 14 „
$\frac{9}{16}$–$\frac{7}{8}$ in. „ 18 „	2–4$\frac{1}{2}$ in. „ 10 „
1 in. and above „ 14 „	5–8$\frac{1}{2}$ in. „ 6 „
	9 in. and above „ 4 „

Most of the trouble experienced with hack saws is due to the use of a blade unsuited for the work, and if the best results are to be obtained at a minimum cost it is essential to select the correct pitch of tooth. Table I forms a useful guide in this respect.

It should be borne in mind that the dimensions of the cutting surface must be taken into account, as well as the nature of the material to be cut. Table II will be of assistance if read in conjunction with Table I.

With the high-speed steel blades there are two methods of working, *i.e.*, to run the blade at a speed of 120 strokes per min., with coolant and little or no added weight; this reduces the time of cutting to about half the time taken by an ordinary tungsten-steel blade, which cannot be run at more than 70 strokes per min. on hard steels. The second method is to keep the speed at 70 strokes per min. on hard steel, and gradually add weight to keep up the time taken to complete the first cut. The cutting speed is thus the same as with the tungsten blade, but the useful life is from five to ten times as great. It may here be mentioned that the hack-saw machines in the testing department at the Composite Steel Works, using high-speed steel saws, regularly cut 3-in. dia. 1.30 per cent. carbon-steel bars having a Brinell hardness of 300 at the rate of 1 sq. in. per min.

Speaking generally, the light power machines have no lift on the return stroke and are run without coolant. Their speed should not exceed 60 strokes per min., and a new blade should not require any added weight.

Venting.

By Thomas Davis.

The principle governing the venting of moulds is seldom given the serious consideration which it deserves. It is, of course, to allow the free escape of steam and gases formed by the molten metal during the filling of the mould. Vent wires are generally made of steel, and are of varying lengths and thicknesses. For small bench work, with not much depth of sand, a knitting needle fitted with a small handle makes a very suitable vent wire. Moulds of medium size require a vent wire of $\frac{1}{8}$ in. dia., and for large moulds, where a good depth of sand has to

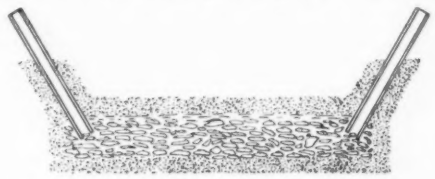


FIG. 1.—COKE BED, SHOWING VENT PIPES.

be pierced, the vent wire may be $\frac{1}{4}$ in. or $\frac{3}{8}$ in. dia. and fitted with a cross-handle as is shown in Fig. 2 (C).

A mistake which some moulders make is to sharpen the point of a vent wire. When the wire possesses a flat end a clear hole is made which allows the gases to pass freely away from the mould surface. Furthermore, the wire carries with it a small pad of sand, which forms a "first line of defence" against the metal penetrating the vent.

When a mould is too large for effective venting from the joint, recourse must be made to a coke bed. Fig. 1 shows a section through a coke bed, with vent pipes at each end for carrying off the steam and gases. In preparing such a bed the bottom should be rammed solid with a flat rammer. Over this a layer of roughly-broken

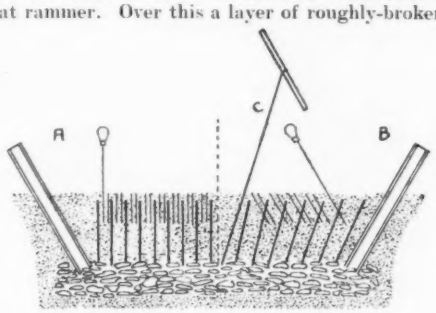


FIG. 2.—VENTING OF MOULD.

coke is spread to a depth of 6 in. and made solid with the rammer. It is then roughly levelled off with smaller pieces of coke, and vent pipes are inserted in such a position as will readily clear the top part and yet draw the gases from the bed. It is sometimes advisable to lay the coke bed 6 in. wider on each side of the pattern. This will allow the joint vents to be pierced down to the coke bed and smoothed over with a trowel, thus avoiding taking out vents at the joint of the mould.

In Fig. 2, (A) and (B) show two methods of venting from the face of the mould into the coke bed. In either case the large vents are closed about an inch below the surface. The surface vents are led into the large vents by means of a small needle wire, and these are closed by smoothing over with a piece of wood or joiner's cork. Fig. 2, (A), shows the "straight-down" method of venting. In this case it will be seen that many of the surface vents miss the large vents, and are not only of no real value, but are a real source of danger. Fig. 2, (B), shows the sloping method of venting. In this case the surface vents are pierced in the opposite direction and are certain to find some of the large vents. Hence (B) is the better method.

When the moulder is thoroughly conversant with the correct method of venting for large castings he will experience little difficulty in making the necessary modifications for medium and small castings.

The Carnegie Scholarship Memoirs.

Volume XIX of these Memoirs, published by the Iron and Steel Institute, contains two works of direct interest to the foundry. "The Effect of Nickel and Silicon on the Properties of Whiteheart Malleable Cast Iron (with Special Reference to 'Thin-Walled Malleable')," by S. J. E. Dangerfield, F. Johnson, D.Sc., and E. R. Taylor, A.R.S.M., concludes with the following remarks:—

The influence of nickel up to 3.66 per cent. on cupola-melted white iron for the manufacture of thin-walled whiteheart malleable cast iron has been studied. The results show that:—

(1) Nickel improves the fluidity of white iron.

(2) Test-bars, $\frac{3}{16}$ in. thick, possess a white fracture as cast, even when the nickel reaches 3.66 per cent., the corresponding graphitic carbon being 0.27 per cent.

(3) The following represents the average composition of the bars as cast, excluding nickel:—

Total carbon.	Silicon.	Sulphur.	Phosphorus.	Manganese.
3.41	0.65	0.196	0.055	0.08 per cent.

(4) The influence of nickel on the mechanical properties of the annealed bars is definitely to increase the tensile strength, which reaches a maximum at 2.5 per cent. of nickel, thence falling sharply to a very low value at 3.66 per cent. (6.4 tons per sq. in.). The percentage elongation falls progressively with increase of nickel. Bend tests show that the bars containing 0.70 per cent. of nickel give the best results.

(5) Workshop tests show that nickel does not impair the machining quality of the annealed castings.

(6) Microscopic examination of the annealed bars shows that nickel is responsible for a diminution in the size of the temper-carbon nodules and, up to 2.8 per cent. of nickel, for a retardation in the rate of migration of carbon during annealing, thus leaving behind more combined carbon, which impairs the toughness and ductility of the bars. At 2.5 per cent. of nickel, most of the carbide occurs as an intercrystalline network, enmeshing crystals of ferrite, the structure being fine-grained. The aggregation of carbide at the crystal boundaries is attributed to the influence of nickel in widening the temperature interval of the Ar_1 range.

With 3.6 per cent. of nickel, only 0.085 per cent. of carbon is left in the annealed bars; as a result, oxidation is so severe as to cause "burning" and rottenness.

The second Paper covers work done by Dr. Emanuel Valenta at the Skoda Works, Pilsen, Czecho-Slovakia, on the subject of "Heat- and Acid-Resisting Cast Irons with High Chromium and Carbon Contents." After 24 annealings at 800 deg. C. for 3 hrs., a 100-mm. bar made from an alloy containing C 1.43, Si 2.30 and Cr 27.91 per cent. only grew 0.00193 per cent., as compared with cast iron (C 3.35, Si 2.44, Mn 0.61, S 0.096 and P 0.73 per cent.) 1.243 per cent. There are a vast amount of experiment data and theoretical considerations embodied in this Paper.

The Skoda Works at Pilsen.

VISIT BY MEMBERS OF THE IRON AND STEEL INSTITUTE.

The Skoda Works, founded by Emil Skoda in 1869, are the most important in the Republic of Czecho-Slovakia and one of the largest iron and steel works on the Continent of Europe. The Pilsen Works, which, with their extensive steelworks, forges and foundries form the nucleus of the Skoda undertaking, cover an area of 560 acres, of which 121 acres are under cover.

Fig. 1. Aerial View of the Skoda Works at Pilsen.

In Czecho-Slovakia alone the Skoda Works own nine large works—Plzeň (Pilsen), Doudlevce, Nýřany, Hrádek, Prague-Smíchov, Mladá, Boleslav, Hradec Králové, Brno (Brünn) and Komárno (Komorn)—and large repair works at Prague - Smíchov, Brno, Moravská Ostrava (Mährisch-Ostrau), Bratislava (Pressburg), Teplice, České Budějovice, Košice (Kaschau) and one factory in course of construction at Dubnica as well as several collieries and other mining undertakings, large limestone quarries and kilns. The total area of the various works, both built over and open spaces, is 2,101 acres, freehold property.

Since 1899 the Skoda Works have been a joint stock company, and at the present moment have a share capital of Kč. 200,000,000 (sterling equivalent at rates of exchange, current at date of issue, £4,278,424). The company has in its own employment about 35,000 people, exclusive of those occupied at the factories of the Skoda Works' subsidiaries, where there were over 5,000 additional employees.

Several affiliated companies, founded in recent years, are controlled or managed by the Skoda Works, viz., "Avia" Aircraft Company, in Prague; "Asap" Company for the automobile industry, in Prague; "Konstruktiva" Company for road making; Czecho-Slovak Air Transport Company, in Prague; the Polish Skoda Works (aero engines, electrical engineering and cable works), in Warsaw (Poland), etc. The Skoda Works have a financial and business interest in a number of undertakings at home and abroad, namely, Czecho-Slovak Arms Manufacturing Works, in Brno (Brünn); "Kablo" Cable and Wire-Rope Works, in Kladno; Novák & Jahn's Engineering Works, in Prague and Adamov; Uzinelle Metallurgice Ploesti (Rumania), etc. The Skoda Works have commercial representatives in all countries. In Czecho-Slovakia alone they have over 400 selling offices and agents.

The works have an internal railway system, with 26 miles of standard-gauge track, 10 locomotives, 130 trucks of various types, a number of special trucks of 40 tons capacity, and bridge trucks for large and heavy pieces. Two power stations, with a combined output of 40,000 kw., provide the works with electric current and steam.

The furnaces of the steelworks, forges, foundries, annealing and hardening works are heated with producer gas from 35 producers. The maximum coal consumption of these producers is about 650 tons per 24 hrs., and their output is 42,380,000 to 49,440,000 cub. ft. of gas per 24 hrs. In addition to this a double gas-producer plant has been installed for about 8,830,000 cub. ft. per 24 hrs., burning about 250 tons of coal in 24 hrs.

In all 360 furnaces of various sizes are in the workshops. There are about 370 electric cranes, with a total lifting capacity of nearly 5,000 tons. Among them there are cranes of 50, 60, 80, 100 and 120 tons lifting capacity, and spans up to 75 ft. The cranes are operated by about 1,000 electric motors. In all there are at the works 3,600 electric motors, with a total output of 60,000 h.p. Of presses of various sizes and designs, with a total pressure of 40,000 tons, there are 100 in the shops. The largest of these machines exerts a pressure of 10,000 tons. The workshops are equipped with about 5,000 machine tools, some of them for dealing with pieces weighing up to 100 tons.

Fig. 2.—View in Moulding Shop of the Steel Foundry.

Fig. 3.—Part of the Moulding Shop of the Electric-Steel Foundry.

Among these machine tools there are some of gigantic dimensions, for instance, a lathe with centres 72 ft. apart and a boring capacity of 81 ft., a lathe with a horizontal face plate for machining pieces up to 39½ ft. in dia., etc.

Steelworks and Foundry.

The steelworks were founded in the year 1885 and have been constantly enlarged since that time. There are nine open-hearth furnaces, which are partly acid and partly basic; they have a normal total capacity of about 300 tons—the two largest having a capacity of 50 and 65 tons respectively. These furnaces are built in a row one beside the other, and are served by three charging machines, each of which is designed for a capacity of 2 tons. There are four semi-portal cranes of 15 to 60 tons capacity on the discharge side of the furnaces.

The molten steel is distributed by means of semi-portal cranes to the various bays, which are at right angles to the line of furnaces. Of these bays, four, with a total area of about 47,360 sq. ft., are for casting ingots, and seven, with a total area of 85,250 sq. ft., for castings. The moulds are prepared in the moulding shop, where there are cranes of 5 to 60 tons capacity. Machine moulding is carried out by 7 hydraulic moulding machines, 5 moulding machines for gears, 6 pneumatic moulding machines, 2 mixing machines and various core machines. For auxiliary work there are 2 cupola furnaces and 7 drying stoves, gas-heated, with a total area of 2,713 sq. ft. Further, in a separate building, there is also an extensive sand-preparing plant. There are 10 annealing furnaces, with a total area of 2,885 sq. ft. The largest annealing furnace has an area of 737 sq. ft.

Electric-Steel Foundry.

The electric-steel foundry is adjoined to the main steelworks, and comprises 3 electric furnaces, viz., 2 Héroult furnaces of 6 tons each, and a Fiat furnace of 10 tons. All these furnaces are provided with basic linings. The steel produced in these furnaces is fed either to the adjoined moulding shop for small electric-steel castings or to the moulding and ingot shop of the main steel foundry. The moulding shop for small electric-steel castings is arranged in two halls, covering an area of over 19,000 sq. ft., and is provided with hydraulic and numerous pneumatic machines of various modern types, and a central sand-preparing plant which is provided with mechanical conveyors. The small electric-steel castings are cleaned in

Fig. 4.—View in Moulding Shop of the Grey-Iron Foundry.

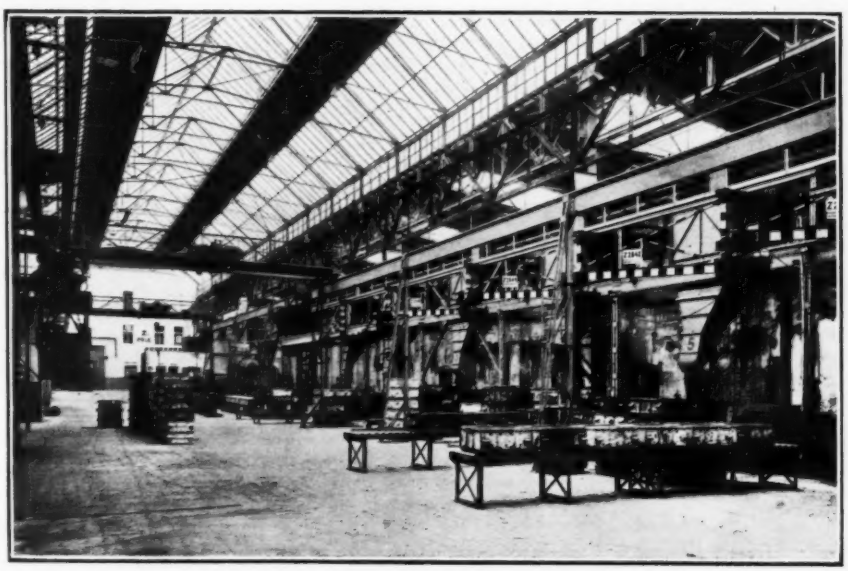


Fig. 5.—Moulding Shop for the New Grey-Iron Foundry.

an independent fettling shop provided with sand blowers, and in a finishing shop fitted with two annealing furnaces for treating finished castings. This shop is also fitted for producing and casting the special fireproof and acidproof chromium alloys "Ferchromit" and "Neochrom."

Grey-Iron and other Foundries.

The grey-iron foundry is organised for a yearly output of 15,000 tons of castings. This foundry is divided in two sections, one being for large pieces, the other for small castings produced in mass. Each of these shops has an independent fettling shop and a special core shop. The melting furnaces are common to both shops. The foundry for large pieces has a yearly capacity of 10,000 tons and covers an area of about 130,000 sq. ft., the foundry for small mass products delivers yearly about 5,000 tons and covers an area of about 6,500 sq. ft. Both sections are equipped with up-to-date moulding machinery, especially the smaller foundry for mass production, in which the sand is fed to the machines on galleries. In the foundry there are seven drying stoves; in the core shop of the smaller foundry there are eight further stoves for core drying and a vertical conveyor drier for

drying after painting and gluing. These driers are gas-heated.

The melting equipment of both foundries comprises 6 cupola furnaces for melting about 35 tons of iron hourly, an electric Héroult furnace of 4 tons capacity and an oil-heated drum furnace for special alloys. A special acid-proof iron alloy, "Fersilit," is cast in the large foundry. The grey-iron foundry is provided with a separate shop for manufacturing metal patterns.

The brass and aluminium foundry was established in 1929 and is one of the largest of its kind in Europe. Its building covers an area of 108,000 sq. ft. and is fitted for an annual output of 1,300 tons of yellow metals, 650 tons of aluminium and 200 tons of "electron." These castings are moulded and cleaned in separate halls and fettling shops, but have a common core shop and sand-preparing plant and melting equipment. Melting is effected throughout in gas-heated crucible and drum furnaces and in an electric furnace.

Forges.

The forges of the Skoda Works are arranged in two large shops—viz., one for the production of heavy forgings and rolled tyres and of discs for pairs of wheels and axles for railway vehicles, and the other for forgings of medium and small weight and die casting.

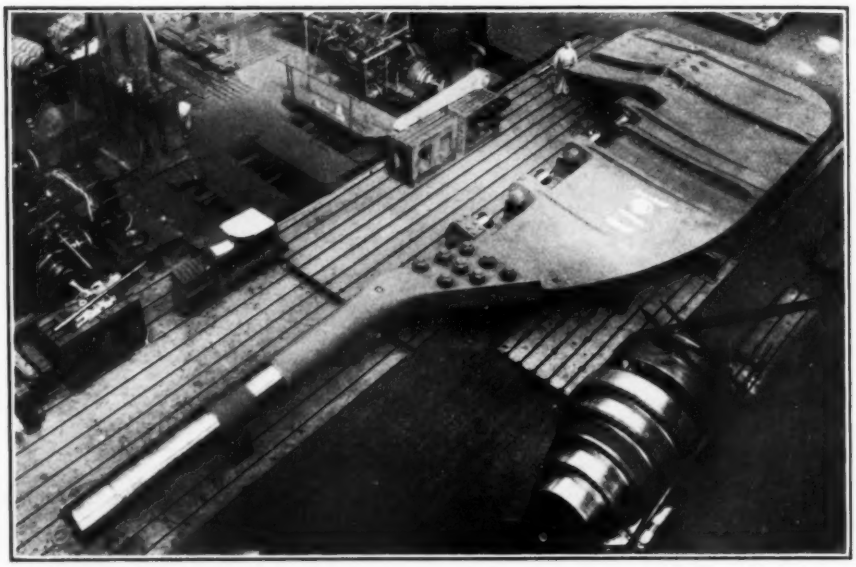


Fig. 6.—Cast-Steel Rudder, with Forged Spindle, weighing complete 65 tons.

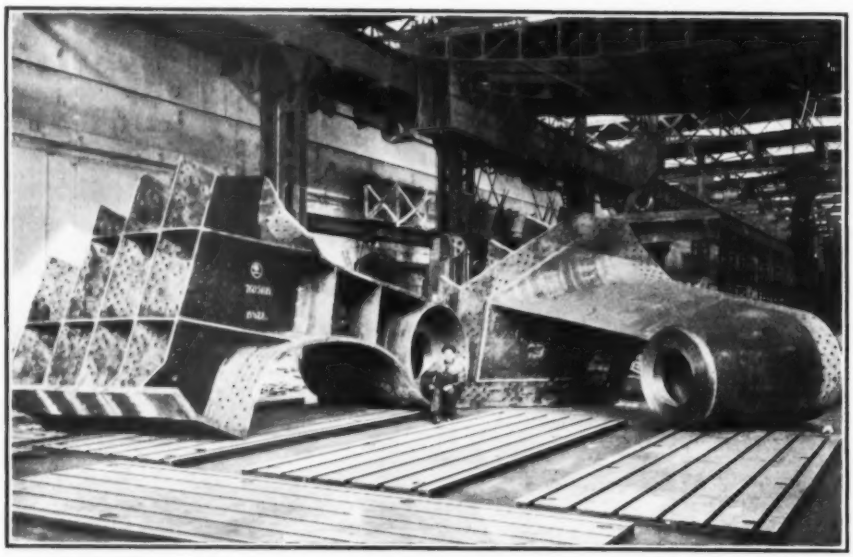


Fig. 7.—Two Stem Frames weighing 32 tons each, at the Skoda Works.

The equipment for the large forge consists of four hydraulic and steam presses of 1,000, 1,500, 2,500 and 5,000 tons working pressure. These presses are of most up-to-date design. The steam for the presses has a pressure of about 160 lbs. per sq. in. The pressure water for return cylinders of the presses, hammer slides and other auxiliary equipment comes from a central pumping station provided with pressure pumps and accumulators and air compressors. The exhaust steam is led into the central power station and serves, on the one hand, for low-pressure turbines, and, on the other hand, for heating purposes.

For preheating there are 11 furnaces heated by producer gas. These furnaces are provided, on the one hand, with regenerators; on the other hand, with recuperators for preheating the air. Large ingots are heated in truck furnaces. The largest of these furnaces has a charging area of 280 sq. ft. These furnaces are provided with optical recording pyrometers for controlling the temperature. For annealing the forgings six special furnaces are provided. These furnaces are also provided with automatic pyrometric control.

The transport between the furnaces and presses as well as the manœuvring at the presses is provided for by 23 electric cranes. The 2,500- and 5,000-ton presses are always attended by two cranes, the movements of which are controlled from special stands provided on both sides of the controlling and handling platform of the press. One of these cranes is provided with an electric slewing device. This arrangement permits forging without counterweight, as by the above-mentioned two cranes with the slewing device the forging can be readily handled and ingots weighing up to 110 tons can be dealt with. The productive capacity of this plant amounts to about 2,000 wagon loads of finished products, including shipbuilding parts; forgings for general engineering; rotors, turbine shafts and wheels; crankshafts, in one piece or built-up; high-pressure boilers and reservoirs; forged flywheels for gyroscopes; forgings of anti-magnetic steel. In the large forge is further installed the plant for manufacturing rolled tyres and discs for wheels and axles. This plant consists of two steam-hydraulic presses of 1,500 and 1,000 tons, one hydraulic press of 800 tons, two tyre-rolling machines and one disc-rolling machine. These rolling machines are electrically driven. The tyres and discs are produced in the large forge exclusively in one heat.

Fig. 8.—View in Erecting Shops for High-Power Gas Engines at the Skoda Works.

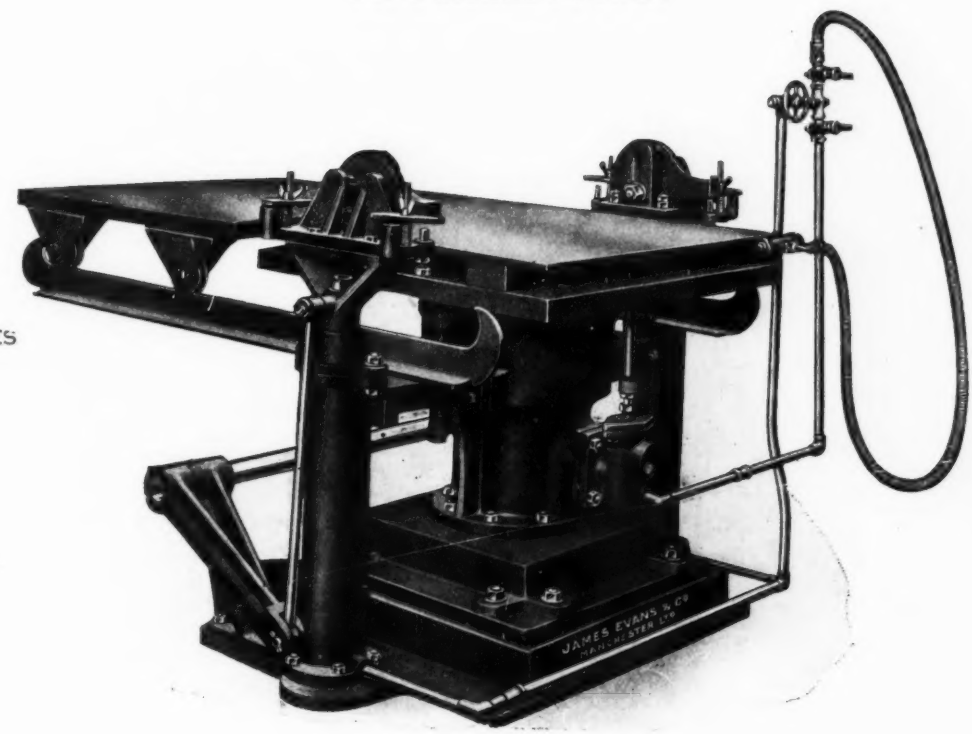
TYPE "C"

JAR RAM MOULDING MACHINE

with Turnover Pattern Plate.

For Pneumatic Power.

TWO MACHINES IN ONE.



UNSKILLED LABOUR ONLY REQUIRED.

The above machine illustrates a Jar Ram Machine with Turnover Pattern Plate which can also be used for Stripping Plate Work.

The machine has been designed to combine the two distinct features above mentioned, and is practically two machines in one, equally suitable for steel. iron, etc.

The machine as illustrated is arranged for work that requires turning over, such as steel moulding. And while the turnover arrangements are intended for general repetition work, by detaching the turnover plate from the trunnion brackets the machine can be used for stripping plate work by attaching the stripping plate to the trunnion brackets. Or, on the other hand, by removing the trunnion brackets as well, the table can be used for jolting general jobbing work.

A very important feature of the machine is the simplicity with which the intensity of the Jolt can be regulated when the operator has become accustomed to the use of the machine, which takes but an hour or so. The valves all being on the exterior of the machine are easily accessible, and there is an adjustable arrangement that will allow the jolt to be varied between 1½ in. to below ¼ in. This being done without disturbing any part of the machine.

The machine is supplied with Withdrawal Carriage, Vibrator, and Blow-off Nozzle complete. It is substantially constructed to stand heavy wear and tear, and requires a minimum amount of skill to operate.

Another important feature of the machine is in the arrangement of the hard wood anvil block for receiving the shock. The blocks being carried well down the machine in a specially designed annular chamber give considerable relief to the foundations. It also provides against the possibility of fracturing the jolting table. Pitch pine blocks are also inserted between the foundation plate and the machine bedplate to assist in the relief on the foundations, and these features considerably improve the working advantages of the machine.

IT IS ALSO ENTIRELY OF BRITISH DESIGN AND MANUFACTURE.

JAMES EVANS & CO. (M/c) LTD.

Britannia Works, BLACKFRIARS, MANCHESTER.

For reheating the material two movable gas-fired furnaces are provided. The furnaces are provided with regenerators for air preheating by flue gases. The tyre-rolling machines serve also for producing laminated rings for other purposes (toothed rims, etc.). Rings of up to about 13 ft. dia. and about 7 tons in weight can be rolled. This plant is most up to date, and its productive capacity is of about 2,000 wagon loads yearly.

For heat-treatment of the forgings, a large special annealing plant is provided. The annealing furnaces include horizontal truck furnaces and vertical furnaces of a special construction for annealing forgings of great length in a vertical position. The furnaces are heated by producer gas. In the horizontal furnaces pieces of up to 23 ft. in length, 13 ft. in dia. and 60 tons in weight can be reheated. In the vertical furnace pieces of up to about 66 ft. in length, 2 ft. 6 in. in dia. and 30 tons in weight. Quenching is carried out either in water or oil or by water sprays.

The die forge is equipped for the production of forgings of medium and small sizes, weighing up to 3 tons. These shops are occupied with jobs and mass production. The dies are produced in special shops provided with modern machines, and an automatic copying milling-cutter system for multiple manufacture of dies on patterns or models. Provision is made for heat-treating the products, the furnaces being gas-fired.

The manufacturing programme includes locomotives, railway wagons, motor-cars, etc.

Reports and Dividends.

Qualcast, Limited.—Net profit, £23,076; brought in, £13,309; dividend of 12½ per cent.; carried forward, £21,656.

John Hetherington & Sons, Limited.—The directors are unable to recommend the payment of the half-year's dividend on the preference capital due on September 30.

Ibbotson Bros. & Company, Limited.—Net profit, £5,381; brought in, £75,936; available, £80,559; dividend of 4s. per share, making 5 per cent., tax free; carried forward, £75,889.

A.B.C. Coupler & Engineering Company, Limited.—Net profit, £15,268; brought in, £4,383; to reserve, £5,000; final dividend on the ordinary shares of 7½ per cent., making 12½ per cent.; carried forward, £4,230.

Samuel Marsden & Son, Limited.—Profit, after writing off £2,011 for depreciation, £2,994; brought in, £4,231; debenture interest, £1,700; preference dividend for two years to June 30, 1928, £4,400; carried forward, £2,875.

Thos. W. Ward, Limited.—Profit, £80,078; brought in, £36,677; preference dividends, £30,953; dividend on employees' shares, tax free, £2,643; total dividend on the ordinary shares of £6 9s. per cent., £55,000; carried forward, £28,159.

James Dunlop & Company, Limited.—Credit balance, including amount set aside for taxation and not now required, of £2,564. Deducting this from the debit balance of £26,218 brought in, there is a debit balance of £23,644 to be carried forward.

Dunswart Iron & Steel Works, Limited.—This South African company reports a net profit, after writing off £7,654 for depreciation, of £20,718; brought in, £4,497; dividend of 7½ per cent. on both the preference and ordinary shares; carried forward, £13,402.

Imperial Smelting Corporation, Limited.—The first report states that gross dividends and interest received during the period amounted to £360,483. Included in this was a special non-recurring dividend of £65,000, of which £64,119 has been applied by the directors to writing off the whole of the preliminary expenses. A net balance of £231,372 was available, and directors propose a dividend of 5 per cent on ordinary shares, carrying forward £35,360.

The Steel Construction Company, Limited, Motherwell, have secured a large order for steel derricks from the Burmah Oil Company, Limited.

The Třinec Ironworks, Czecho-Slovakia.

These works were visited by members of the Iron and Steel Institute in connection with the Prague meeting. They are owned by the Czecho-Slovak Mining & Ironworks Company, and were started in 1834 with the erection of a blast furnace. A foundry was added in 1842 and enamelling works in 1844. By the acquisition of the Gabriella pit in 1862 and the building of the Kaschau-Oderberg railway in 1869 the further development of the works was greatly favoured. In 1873 further additions were made in the form of 70 coke ovens (System Gobiet) and in 1874 by the erection of two blast furnaces producing coke iron. The Bessemer works at Karlshütte were transferred to Třinetz in 1877.

The mill for rolling light material, as well as the puddling furnaces, the 15-ton hammer, the mills for rolling heavy material and tyres, were transferred in 1878 from Ustron.

In 1882 the ore mines in Marienhütte were acquired and a central boiler-house was erected in 1885. The first open-hearth furnace was set up in 1887, and further two such furnaces were added in 1890. In the same year the works for producing refractory materials and the engineering workshops were also put in commission.

Further extensions in subsequent years included a reversing rolling-mill in 1891 with soaking pits, a 12-ton Schönwälder furnace in 1894, a steel foundry in 1895, a battery of 60 coke ovens (System Hofman) with by-product recovery in 1896-97, steelworks with four open-hearth furnaces in 1898, a third blast furnace in 1899 and a rotary furnace in 1905. In that year the Friedrich works were turned into a limited liability company.

In the subsequent years some of the existing departments were discontinued and new plants installed. To-day the Třinec works comprise the following plants: A factory for producing fireclay and silica bricks, a coal washery, four coke-oven batteries of 153 ovens with a daily output of 1,400 tons, plants for producing ammonia and benzol, three rotary furnaces for sintering ore, a plant for extracting copper with Glauber salt and zinc recovery, four blast furnaces with a daily output of 1,500 tons of pig-iron, a gas-holder of 30,000 cub. m. capacity, five blowing engines driven by gas, nine 35-ton open-hearth furnaces, two of 30 tons each, one 70-ton tilting furnace, a 300-ton pig-iron mixer, a steel foundry with a 15-ton open-hearth furnace and a Boshardt furnace, electrically-driven rolling-mills with an output capacity of 1,000,000 tons per annum, comprising a cogging mill, a reversible finishing mill, a continuous mill for billets and sheet bars, a train for rolling heavy material, one for rolling medium-sized material and two for rolling light material, besides a wire mill.

Other plants include a workshop for producing small railway material, a grey-iron foundry for producing mill rolls and other heavy and light castings, a metal foundry, a shop for making railway switches, an engineering shop for building and repairing machinery, another shop for building electrical machinery, etc. The electric central power station has a total output of 27,100 kw. There is also a special laboratory for chemical-technical experiments.

On January 1, 1930, the company employed 486 engineers, officials, foremen and inspectors. The number of workmen employed on that date was 5,089.

The site occupied by the works has an area of 371.27 hectares (nearly 920 acres).

The undertaking's output in 1929 included 475,000 metric tons of pig-iron, 506,900 tons of steel ingots, 424,000 tons of rolled products, 3,800 tons of steel castings, 368,600 tons of coke, 4,800 tons of sulphate of ammonia, 4,500 tons of benzol, 18,500 tons of grey-iron castings and 58,500 railway switches.

Copper Still Slumping.

By "Onlooker."

The disastrous fall in copper still continues, and an impetus has recently been given to the break by the publication of extremely adverse statistics for the month of August. Briefly stated, these disclosed an increase of 25,000 tons in stocks of refined copper and a decrease of 8,000 tons in reserves of blister to 234,000 tons, while the refined tonnage stands at the enormous figure of 347,000 tons. This stock of refined metal has approximately doubled since the beginning of the year, and, although there is expectation of inroads being made during September and October, the state of trade is so indifferent that the reduction, if any, is not likely to be very great. The fall in blister stocks reflects the curtailment of mine production in the United States, but refinery output shows only a small decline and the problem of stock reduction has evidently not been seriously tackled yet from that angle.

In other parts of the world, however, expansion, and not curtailment, is taking place, and it is notorious that Canada is forging ahead rapidly as a producer of the red metal, although it is difficult to believe that with the price below £50 some pause will not be given to the extensive development programmes now under consideration. At the time of writing two recent falls in electro have brought the selling price below £50 per ton, and it is suggested that the big producers are encouraging a low price with the deliberate intention of forcing the high-cost producers out of the picture. This, apparently, will be rather a long job, and if copper is to be saved from a still further relapse a drastic reduction of output must be commenced without delay. For their foolishness in holding the price of copper at 18 cents for a twelvemonth when every indication pointed to the fact that a reduction was necessary in the best interests of all concerned, the producers are paying very dearly, and, since consumers now hold all the cards, it is difficult to believe that another fall in values can be avoided.

The difficulties in the way of starting another buying movement are obvious. Consumers are already fairly well covered, especially in America, and, since business with ultimate buyers is on a small scale, they can see absolutely no reason to jump in and buy. Copper is to-day vested in a single control, which not only governs the price and general policy of sales, but also has to carry the huge stocks of refined metal. When reserves of copper were low, the associated producers used the fact as a whip to flog the consumers into buying, but now the tables are turned with a vengeance and the whip has become a rope to bind the hands of those who used it. Instead of being distributed among consumers and merchants, as in the days before the Copper Cartel was formed, or, for that matter, as it might have been, had the selling policy of the combine been sound, the reserves of refined copper are lying at the North American refineries advertising the fact to all the world that the situation is top heavy and out of hand.

For present conditions the American combine is entirely to blame; in spite of bad trade the quotation for copper would not have slumped to its present low level had things been handled properly. Any recovery at the moment is unthinkable, and the opinion is gaining ground that 1930 will not see the beginning of any upward movement in copper values, which may, perhaps, come in the spring of 1931. A production holiday has done little so far to help tin. What of the outlook for copper when, up to the present, no real concerted action regarding curtailment has been taken?

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A Competition has been arranged, upon an international basis, in order to encourage the attention of inventors and other technicians to aluminium and light aluminium alloys. The conditions are simple. Entries will be judged impartially by an appointed jury. The awards will be in two sums of 25,000 francs (say, £200), divisible only in the case of entries of equal merit. A special prize of 50,000 francs (say, £400) may be given in the event of an entry of exceptional interest or value.

EXTRACTS FROM RULES

1. The competition is open to inventors in all countries. Prizes will be offered for the best suggestions for new applications of the metal and its alloys or for improvements in its manipulation.
9. The competition commences on the 1st January 1931.
11. No invention which has been patented before the commencement of the competition can be entered.
12. In order to protect the inventor, competitors are invited to take out provisional patents covering their entry, after the date of the commencement of the competition.

All Information relating to the Competition will be furnished gratis by the

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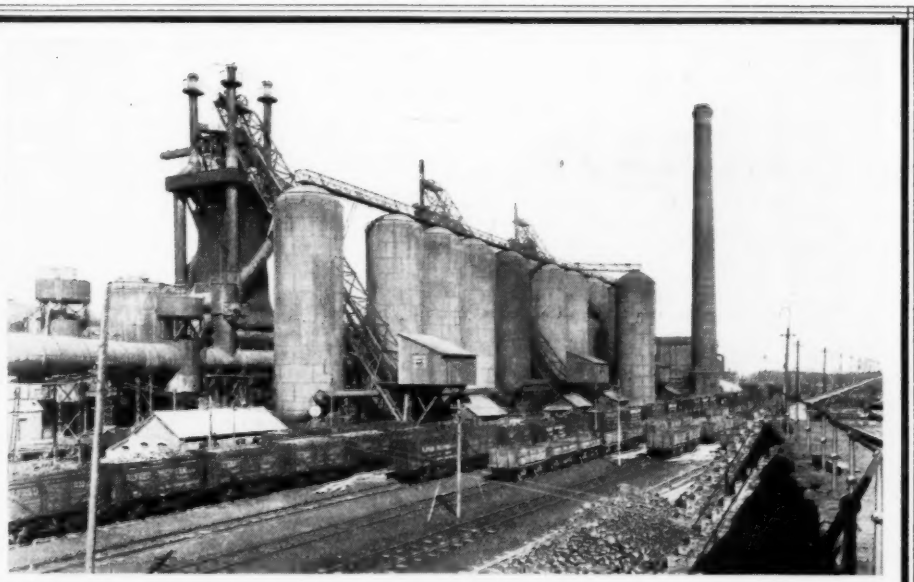

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Trade Talk.

Messrs. C. A. Parsons & Company, Limited, Newcastle-upon-Tyne, have, it is stated, been asked to supply 12 turbines for the new Cunarder which is to be built on Clydeside.

Messrs. Swan, Hunter & Wigham Richardson, Limited, have booked an order for a small passenger steamer for Yugoslav owners. She will be built at the Neptune yard at Walker-on-Tyne.

Messrs. A. Reyrolle & Company, Limited, electrical engineers, Hebburn-on-Tyne, propose to increase the capital of the company from £500,000 to £700,000 by the creation of 200,000 shares of £1 each.

Messrs. William Denny Bros., Limited, Dumbarton, have received an order from Messrs. David MacBrayne, Limited, for a new vessel for the Oban-Staffa-Iona summer service and Gourock-Ardrishaig winter service.

An order has been received by Messrs. Sir W. G. Armstrong, Whitworth & Company (Engineers), Limited, Newcastle-upon-Tyne, for three mobile Diesel-electric locomotives for the Buenos Aires Great Southern Railway Company.

A contract has been placed by the Cunard Steamship Company with Messrs. Vickers-Armstrongs, Limited, Barrow, for the overhaul of the propelling machinery and the renewal of the high-pressure turbine casings of the steamer "Carinthia."

An outbreak of fire, on September 28, at the works of Messrs. George Kent, Limited, engineers and founders, of Biscot Road, Luton, is reported to have destroyed about 2,000 patterns. The pattern store and an adjoining timber store were badly damaged.

The Lea Recorder Company, Limited, have removed their head office and sales department from 28, Deansgate, Manchester, to new offices adjacent to their Burnside Works. Their new address is: Recorder House, Cornbrook Park Road, Manchester.

Damage estimated at several hundreds of pounds was caused by fire which occurred at the ironworks of Messrs. Clay Cross Company, Limited, on September 24. The section involved was the naphthalene distillation plant, situated at the rear of the coke ovens.

Extensions of gas and water mains are providing useful orders for the pipe foundries. The Staveley Coal & Iron Company, Limited, have booked orders for 900 tons of cast-iron pipes for the Colne Valley Waterworks, 1,800 tons for the Gas Light & Coke Company, and 682 tons for South Africa.

Lanarkshire Bolt & Rivet Company, Limited, have been granted a lining by Hamilton Dean of Guild Court for the erection of new works on a site opposite their present works. The new plant will be more modern than that used at present, and it is anticipated that additional men will be employed.

Messrs. Braithwaite & Company (Engineers), Limited, have secured, in the face of strong competition from the Continent, an order from the South African Railways for the supply of 11 bridge spans of 100 ft. each. These spans will be manufactured at Newport and shipped direct to South Africa.

The Association for the Promotion of Co-operation between Scientific and Technical Societies and Institutions within the British Empire has been registered as a company limited by guarantee. Sir John Cadman, Sir Robert Hadfield, Dr. A. E. Dunstan and Mr. F. W. Harbord are among the members of council.

Messrs. Vickers-Armstrongs, Limited, have completed at their Barrow shipyard the turbine steamer "Mayon," built for Messrs. T. L. Duff & Company, Glasgow. The ship has been specially designed for trading in the Far East and will carry passengers and cargo. She is fitted with two sets of Parsons single-reduction geared turbines.

Messrs. Ridsdale & Company, consulting metallurgists and analytical chemists, of 3, Wilson Street, Middlesbrough, whose name is well known in connection with British Chemical Standards, in addition to their regular analysis of materials for the iron, steel, foundry and non-ferrous industries, have recently been approved by the Air Inspection Directorate for the chemical analysis of metallic materials.

The Economic Mission to the Far East, on behalf of the Department of Overseas Trade, left London on Friday, September 19, to join the P. and O. steamer "Macedonia" at Tilbury. The members of the mission are:—Sir Ernest Thompson (chairman), Sir Thomas Allen, Mr. James Bell, Mr. William A. Crowther, Lieut.-Col. Reginald Morcom, Mr. Louis Beale, Mr. T. St. Quintin Hill (secretary), and Mr. F. A. Barnes (assistant secretary).

Mr. Vincent Jobson, chairman and managing director of Messrs. Qualcast, Limited, Derby, speaking at a meeting held in Derby, said that the section of his firm's trade catering for the automobile industry was at present protected and was increasing steadily. The mowing-machine trade, however, was not protected, and although the firm had no British competitors, there was German, Swedish and American competition. Mr. Jobson declared that if these imported foreign products were subject to a 30 per cent. tax, the firm could employ 50 per cent. more workmen and reduce their prices.

It is announced that Messrs. Yarrow & Company, Limited, Scotstoun, together with other British interests, have acquired control of the Kraljevitza shipbuilding yard in Yugoslavia, on the Adriatic coast. Shipbuilding will be carried on there in association with the Glasgow establishment. At the close of the war eight mine-laying vessels in various stages of construction were left on the stocks at the Kraljevitza yard, and these will now be completed by Messrs. Yarrow for the Yugoslav Government. The engines and boilers for the vessels are being constructed at the Yarrow works on the Clyde.

Orders for the supply of British steel to Canada may result from negotiations now proceeding in Montreal regarding the scheme of the Canadian National Railways for a new railway terminal in Montreal, to cost £10,000,000. An official of Canadian National Railways in London stated that representatives of the British Steel Export Association were discussing the matter with Sir Henry Thornton, chairman and President of the Canadian National Railways. The attitude of the company was that Canadian steelmakers must have first preference, and if some types of plates and sections were not rolled in mills in Canada, they would turn to Great Britain to supply their wants.

The Union Steel Corporation (of South Africa), Limited, is offering to shareholders for subscription 100,000 8 per cent. "B" cumulative preference shares of £1 each at par. This issue is being made in accordance with the agreement entered into with the South African Iron & Steel Industrial Corporation, Limited, which is subscribing for 100,000 "A" preference shares on the same terms. In a circular the Union Steel Corporation states that the position and the outlook of the company have been entirely changed by the fusion of interests with those of the South African Iron & Steel Industrial Corporation. But for this fusion it would have been impossible for the company to obtain the additional financial resources required to liquidate its liabilities and to equip the works with the additional plant required profitably to carry out its contracts.

Obituary.

Mr. Alfred Birks, a director of the Meadow Foundry Company, Limited, Mansfield, died recently, aged 65.

Mr. Herbert Sellers, chairman of Messrs. Darling & Sellers, Limited, machine-tool makers and ironfounders, Airedale Works, Keighley, died recently.

The death occurred, on September 23, of Mr. John David Kilgour, who entered the service of the Carron Company, Falkirk, in 1880, and remained there for 47 years, retiring three years ago. He was superintendent of the engineering office for many years and enjoyed the full confidence of the directors.

Mr. Alex. Harley died at Larbert last Thursday after a few months' illness. He was one of the founders of the Stirlingshire Iron & Stove Company, Limited, Bonnybridge, now known as the Broomside Foundry Company, Limited. Mr. Harley was in his 72nd year and retired from active service about a year ago.

New Companies.

Cobham Metal Works, Limited, 1, King's Road, St. Pancras, London, N.W.—Capital £1,000. Directors: G. Douhairet and J. Batchelor.

Associated Brassfounders, Birmingham, Limited, 45, Vyse Street, Birmingham.—Capital £1,000. Directors: R. Magnus and C. R. Arrowsmith.

Personal.

Mr. W. Benton Jones, chairman of the United Steel Companies, Limited, has been elected a director of the Yorkshire Electric Power Company.

Mr. Fritz W. Meyer, foundry consultant, metallurgist and Vice-President of the Mississippi Valley Research Laboratories, St. Louis, U.S.A., is touring Europe to study the latest foundry developments.

Mr. D. A. Currie, Vice-President and general manager of the Erie Foundry Company, Erie, Pa., U.S.A., is now spending two or three months in Europe.

Mr. H. S. Skelton has received a presentation on the occasion of his retirement on September 26, after 32 years' service, on the foundry staff of Messrs. British Insulated Cables, Limited, Prescot.

Mr. H. W. Blanchard, manager of the Austral Ironworks of Messrs. E. W. Tarry & Company, Limited, South Africa, is retiring. It is understood that his assistant, Mr. Bowden, will assume the management of the works.

Mr. Robert Williamson, jun., junior partner in the firm of Messrs. Pott, Cassels & Williamson, Limited, Motherwell, has been presented with a handsome bureau from the employees of the firm on the occasion of his marriage.

Professor Henry Louis is to hold a local inquiry into the possibility of developing mineral production in Merionethshire. He has been appointed to hold the inquiry by Mr. Shinwell, Secretary for Mines, who has had under consideration the position of the metalliferous mining industry generally. Professor Louis is President of the Iron and Steel Institute.

Mr. T. Chambers, for some years chief sales assistant in the foundry commercial department of the Staveley Coal & Iron Company, Limited, has been the recipient of a presentation from the staff of the company on leaving to take up the position of commercial manager of Messrs. Guest & Chrimes, Limited, Rotherham. Mr. Chambers had completed 25 years' service with the Staveley Company.

Mr. Philip Frankel, of Messrs. Philip Frankel & Company, Limited, Barry Parade, Brisbane, Australia, is at present in England, and is returning to Australia some time after October 25. He is desirous of making connection with manufacturers of motor accessories not already represented in Queensland. His address whilst in England is the Bank of Australasia, Threadneedle Street, London, E.C.3. His present address is the Strand Palace Hotel, W.C.2.

Mr. Thomas James Bambroffe, cashier of Messrs. Butterworth Bros., Limited, Newton Heath Glass Works, Manchester, and Mr. Laurence Cassidy, one of the glassmakers, have completed fifty years' service with the firm. At a meeting held at the works on September 26 the managing director, Mr. Walter Butterworth, M.A., J.P., said that so long a continuous record implied mutual respect between employer and employee. Mrs. Walter Butterworth then presented hand-illuminated certificates and gifts of cut-glass to the two members, who briefly replied.

Mr. W. Johnstone, by his own desire, is relinquishing his appointment as managing director of the Brush Electrical Engineering Company, Limited, remaining, however, on the board of directors. Mr. A. T. Brotherton has been appointed to the board as local director at Loughborough. Mr. W. Pearson, who has been for many years with the company, has been appointed general manager. Mr. E. Garcke has agreed to serve the company for another year, and to assume the title and duties of chairman and managing director. In announcing these directorial and managerial rearrangements, the Brush Electrical Engineering Company, Limited, state that they have been decided on "with a view to meeting present-day industrial needs, and to give additional effect to the co-partnership principles now in force."

Wills.

Milner, T. H., of High Street, Tewkesbury, agricultural-implement maker £5,637

Somerville, D., a director of Messrs. J. & W. Somerville, Caledonian Nail Works, St. Ninians £30,235

Auld, H. D., managing director of Messrs. David Auld & Sons, Limited, engineers and founders, Glasgow ... £78,712

Dove, J. M., managing director of Messrs. Cox Brothers & Company (Derby), Limited, lead-sheet rollers and pipe makers £40,816

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Iron and Steel Markets.

Pig-Iron.

MIDDLESBROUGH.—Though the numbers attending the weekly meetings of the Cleveland iron trade are still restricted, the tendency of markets recently has been inclined to a rather more cheerful view of the position, bad, as it seems to the superficial observer of industrial movements. There is, however, one outstanding feature in existing conditions that may justify a more hopeful outlook. The factor in question is the circulation of a few inquiries for forward deliveries. That is perhaps the truest test of the strength of the market. If there is any possibility of a fall in prices, consumers naturally hold off the market. Meanwhile Cleveland iron commands a small, but steady, sale amongst home consumers, though the area of distribution is still restricted. Export sales, for example, are out of the question, and even in Scotland consumption of Cleveland pig-iron is very limited. Prices remain stationary, Cleveland's fixed minima being:—No. 1 foundry iron, 66s. per ton; No. 3 G.M.B., 63s. 6d.; No. 4 foundry, 62s. 6d.; and No. 4 forge, 62s. per ton.

The market for East Coast hematite, on the other hand, appears to be steadily improving. Restriction of output is enabling producers to reduce their stocks, and this in turn has helped to stabilise prices. The latter, of course, are not rigidly fixed, and this is perhaps all to the good, since a certain elasticity enables prices to be adjusted to meet special circumstances. The general market quotation for mixed numbers, however, remains steady at 71s., with the usual 6d. per ton extra for No. 1 quality. On the North-West Coast, Bessemer mixed numbers remain at 70s. per ton, at works.

LANCASHIRE.—Although buying of foundry pig in this area continues slow, there has been so far no apparent deterioration in the position at the foundries, recent reports as to deliveries indicating that as much iron is being taken into consumption as during either of the two previous months. Staffordshire and Derbyshire No. 3 irons are unchanged at 72s. per ton, with Scotch brands at 92s. 6d., all per ton delivered local stations.

THE MIDLANDS.—Demand for foundry pig throughout the Black Country districts gives, as yet, no sign of expansion, the business passing in the weekly markets being on a minimum scale. Consumers under existing conditions decline to enter into forward commitments, confining orders to small proportions sufficient to meet urgent requirements. Quotations are unchanged, Northamptonshire remaining at 70s. for No. 3 and Derbyshire and North Staffordshire No. 3 at 73s. 6d., delivered local stations or sidings.

SCOTLAND.—Extreme depression still prevails in the Scottish pig-iron market. Many of the founders are only partially employed. Even with the limited production of twelve furnaces it is with difficulty that sales of foundry pig-iron can be made. The minimum basis of 76s. 6d. for No. 3 f.o.t. furnaces is still maintained by the makers.

Finished Iron.

Little improvement can be reported in this section of the trade, and, apart from the comparatively good position of the Staffordshire marked-bar makers, there is nothing that is satisfactory in the position. The makers of crown and the cheaper grades of iron are not able to ensure sufficient tonnage to work other than intermittently, and orders representing any weight are quite absent. Prices for crown iron vary from £10 to £10 5s., although this figure would be cut by the works outside the Staffordshire area for quite moderate parcels. There is little support possible for the Staffordshire mills for nut and bolt iron, owing to the continued pressure of Continental competition.

Steel.

In the steel market at Sheffield there is no improvement in the demand for acid and basic billets, and wire rods are in comparatively poor request. Quotations generally are unchanged, but a good deal of price-cutting in order to secure the little business that is offering is reported to be going on.

While the demand for open-hearth steel continues to decline, the call for stainless steels shows expansion, and a heavy output is maintained. Home railway business is poor, and overseas orders for railway material are on an unsatisfactory scale. In the tinplate market business continues quiet, with coke quality quoted at 17s. to 17s. 6d. basis, net cash, f.o.b. Welsh ports.

Scrap.

Although demand is by no means up to normal level, it is satisfactory to note that markets for foundry scrap material are not entirely neglected. On Tees-side this week there has been a little more activity than of late; heavy ordinary cast-iron scrap is realising 52s. 6d.—while machinery quality is quoted at up to 55s. In the Midlands there is a fair demand for machinery cast scrap at 62s. 6d., with light material at 47s. 6d. to 50s. In Scotland heavy cast machinery scrap is still quoted at 55s. to 57s. 6d., light cast iron 45s., with firebars 43s., all per ton delivered consumers' works.

Metals.

Copper.—After remaining comparatively steady around about £45 and upwards throughout the week, the close showed a sudden drop to £43 7s. 6d. a ton, the lowest touched since 1896, when £40 10s. was recorded. The record low level for copper is £35 a ton, recorded in 1889, while the record high level of £198 was reached in 1805, following the Napoleonic wars. This sharp decline may be explained by the continued slackness of trade demand in America. Electrolytic now stands on the basis of 10½ cents, f.a.s. New York, the corresponding value c.i.f. English port being 10.80 cents, or £49 17s. 6d.

Closing quotations:—

Cash.—Thursday, £45 1s. 3d. to £45 2s. 6d.; Friday, £44 10s. to £44 11s. 3d.; Monday, £43 7s. 6d. to £43 10s.; Tuesday, £43 10s. to £43 11s. 3d.; Wednesday, £43 17s. 6d. to £43 18s. 9d.

Three Months. — Thursday, £45 1s. 3d. to £45 2s. 6d.; Friday, £44 11s. 3d. to £44 12s. 6d.; Monday, £43 7s. 6d. to £43 10s.; Tuesday, £43 8s. 9d. to £43 10s.; Wednesday, £43 15s. to £43 16s. 3d.

Tin.—The market for standard tin was also affected by the prevailing depression, and values towards the week-end showed a tendency to lower levels. Eastern sales recently were again below 1,000 tons, and shipments this month are expected to show a decline, while at long last there is evidence that not only has the increase of stocks in this country ceased, but that reserves are being drawn upon.

Official closing prices:—

Cash.—Thursday, £131 7s. 6d. to £131 10s.; Friday, £130 17s. 6d. to £131; Monday, £127 17s. 6d. to £128; Tuesday, £125 5s. to £125 10s.; Wednesday, £125 to £125 5s.

Three Months.—Thursday, £132 17s. 6d. to £133; Friday, £132 10s. to £132 12s. 6d.; Monday, £129 10s. to £129 12s. 6d.; Tuesday, £126 15s. to £127; Wednesday, £126 7s. 6d. to £126 10s.

Spelter.—This market has again been weak on heavier offerings and lack of support, the price slipping back to below £15. Trade demand is still very poor, the low price apparently not acting as a spur to consumption, of which evidence is seen in the very heavy falling-off in the galvanised-sheet exports.

Daily fluctuations:—

Ordinary.—Thursday, £15 7s. 6d.; Friday, £15 5s.; Monday, £15; Tuesday, £14 15s.; Wednesday, £14 10s.

Lead.—An increase of 10,000 tons in American stocks created a "bearish" sentiment in London, and values reacted rather sharply to £17 10s., from which point, however, some recovery has been seen, owing to strong support from an influential quarter. The outlook is a little uncertain, but fairly steady markets seem to be probable.

The week's prices have been:—

Soft Foreign (Prompt).—Thursday, £17 17s. 6d.; Friday, £17 13s. 9d.; Monday, £16 15s.; Tuesday, £16 15s.; Wednesday, £16 8s. 9d.

B.S. Specification, Attachment of Circular Metal-Cutting Saws.—This Specification provides for the attachment of saws or drives in diameter from 10 in. up to 60 in. and over in six ranges. In addition to giving the standard dimensions for the fixing of the saws, the specification includes a recommended method by means of which two ranges of saw diameters can be accommodated on one size of machine. Copies of the Specification (387—1930) may be obtained from the Publications Department, British Engineering Standards Association, 28, Victoria Street, London, S.W.1. Price 2s. 2d. each, post free.

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WEEKLY PRICE CURRENT.

COPPER.

	£	s.	d.
Standard cash	43	17	6
Three months	43	15	0
Electrolytic	46	10	0
Tough	45	10	0
Best selected	46	0	0
Sheets	77	0	0
India	60	0	0
Wire bars	47	10	0
Do. October	47	10	0
Do. November	47	10	0
Ingot bars	47	10	0
H.C. wire rods	49	5	0
Off. av. cash, September	46	6	0 17/46
Do., 3 mths., September	46	6	8 25/46
Do., Sttlmnt., September	46	6	0 3/11
Do., Electro, September	50	1	7 1/11
Do., B.S., September	49	7	6
Do., wire bars, September	50	13	7 1/11
Solid drawn tubes			11½d.
Brazed tubes			11½d.
Wire			7½d.

BRASS.

Solid drawn tubes	10½d.
Brazed tubes	12½d.
Rods, drawn	10d.
Rods, extd. or rlld.	6½d.
Sheets to 10 w.g.	8½d.
Wire	8½d.
Rolled metal	8½d.
Yellow metal rods	6d.
Do. 4 × 4 Squares	6½d.
Do. 4 × 3 Sheets	7½d.

TIN.

	£	s.	d.
Standard cash	125	0	0
Three months	126	7	6
English	126	10	0
Bars	128	10	0
Straits	128	5	0
Australian	126	15	0
Eastern	132	10	0
Banca	129	5	0
Off. av. cash, September	132	14	0 9/11
Do., 3 mths., September	134	6	11 9/11
Do., Sttlmt., September	132	14	1 1/11

SPELTER.

	£	s.	d.
Ordinary	14	10	0
Remelted	13	15	0
Hard	11	5	0
Electro 99.9	16	7	6
English	15	2	6
India	13	5	0
Zinc dust	21	0	0
Zinc ashes	4	0	0
Off. aver., September	15	18	5 13/22
Aver., spot, September	15	15	5 5/11

LEAD.

	£	s.	d.
Soft foreign ppt.	16	8	9
English	18	0	0
Off. average, September	17	17	0 32/44
Average spot, September	17	18	2 5/11

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	26	0	0
Do. V.M. ex-whf.	25	0	0
Rods	30	0	0
Boiler plates	21	0	0
Battery plates	22	10	0

ANTIMONY.

	£	s.	d.
Special brands, Eng.	38	0	0
Chinese	26	10	0
Crude	22	0	0

QUICKSILVER.

	£	s.	d.
Quicksilver	22	10	0

FERRO-ALLOYS AND STEEL-MAKING METALS.

Ferro-silicon—	
25%	£7 17 6
45/50%	£11 10 0
75%	£18 10 0
Ferro-vanadium—	
35/50%	12/8 lb. Va.
Ferro-molybdenum—	
70/75% c. free	4/2 lb. Mo.
Ferro-titanium—	
23/25% carbon-free	11½d. lb.
Ferro-phosphorus, 20/25%	£16 0 0
Ferro-tungsten—	
80/85%	2/3 lb.
Tungsten metal powder—	
98/99%	2/6 lb.
Ferro-chrome—	
2/4% car.	£30 10 0
4/6% car.	£23 5 0
6/8% car.	£22 7 6
8/10% car.	£22 0 0
Ferro-chrome—	
Max. 2% car.	£33 10 0
Max. 1% car.	£37 15 0
Max. 0.70% car.	£42 7 6
70% carbon-free	11d. lb.
Nickel—99% cubes, or pellets	£175 0 0
Ferro-cobalt	9/7 lb.
Aluminium 98/99%	£95 0 0
Metallic chromium—	
96/98%	2/7 lb.
Ferro-manganese (net)—	
76/80% loose	£11 0 0 to £11 15 0
76/80% packed	£12 0 0 to £12 15 0
76/80% export	£10 10 0 to £11 0 0
Metallic manganese—	
94/96% carbonless	1/4 lb.

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten	£0 2 2
Finished bars, 18% tungsten	£0 3 0

Per lb. net, d/d buyers' works.

Extras—

Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to 3/16 in.	1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ½ in.	3d. lb.
Do., under ½ in. × ¼ in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP.

South Wales—	£	s.	d.	£	s.	d.
Heavy steel				2	15	0
Bundled steel and shrngs.	2	10	0 to	2	13	0
Mixed iron and steel	2	7	6 to	2	10	0
Heavy cast iron	2	13	0 to	2	14	0
Good machinery for foundries				2	17	6
Cleveland—						
Heavy steel				2	7	6
Steel turnings				1	17	6
Cast-iron borings				1	12	6
Heavy forge				3	5	0
W.I. piling scrap				2	17	6
Cast-iron scrap	2	12	6 to	2	15	0
Midlands—						
Ord. cast-iron scrap	2	7	6 to	2	10	0
Heavy wrought	2	12	6 to	2	15	0
Steel turnings				1	7	6
Scotland—						
Heavy steel				2	10	0
Ordinary cast iron				2	15	0
Engineers' turnings				1	15	6
Cast-iron borings				1	15	0
Wrought-iron piling				3	7	6
Heavy machinery				3	2	6

London—Merchants' buying prices delivered yard.

	£	s.	d.
Copper (clean)	38	0	0
Brass	28	0	0
Lead (less usual draft)	14	10	0
Tea lead	11	0	0
Zinc	8	10	0
New aluminium cuttings	54	0	0
Brazier copper	35	0	0
Gunmetal	40	0	0
Hollow pewter	97	0	0
Shaped black pewter	72	0	0

PIG-IRON.

(f.o.t. unless otherwise stated.)

N.E. Coast—	
Foundry No. 1	66/-
Foundry No. 3	63/6
Foundry No. 4	62/6
Forge No. 4	62/-
Hematite No. 1	71/6
Hematite M/Nos.	71/-
N.W. Coast—	
Hem. M/Nos. d/d Glas.	79/6
„ d/d Birm.	88/6
Midlands—	
Staffs. common*	—
„ No. 4 forge*	68/6
„ No. 3 fdry.*	73/6
Shrops. basic	—
„ Cold blast, ord.	—
„ „ roll iron	—
Northants forge*	65/-
„ fdry. No. 3*	70/-
Derbyshire forge*	68/6
„ fdry. No. 3*	73/6
„ basic*	—
Scotland—	
Foundry No. 1	79/-
„ No. 3	76/6
Hem. M/Nos.	78/-
Sheffield (d/d district)—	
Derby forge	63/6
„ fdry. No. 3	68/6
Lincs. forge	—
„ fdry. No. 3	70/-
E.C. hematite	83/6
W.C. hematite	86/6
Lincs. (at furnaces)—	
Forge No. 4	—
Foundry No. 3	—
Basic	—
Lancashire (d/d eq. Man.)—	
Derby forge	67/-
„ fdry. No. 3	72/-
Staffs foundry No. 3	72/-
Dalzell, No. 3 (special)	105/- to 107/6
Summerlee, No. 3	92/6
Glengarnock, No. 3	—
Eglinton, No. 3	92/6
Gartsherrie, No. 3	92/6
Monkland, No. 3	92/6
Shotts, No. 3	92/6

*d/d Black Country dist.

FINISHED IRON AND STEEL.

Usual District deliveries for iron; delivered consumers' station for steel.

Iron—	£	s.	d.	£	s.	d.
Bars (cr.)	10	0	0 to	10	15	0
Nut and bolt iron				9	0	0
Hoops	10	15	0 to	12	0	0
Marked bars (Staffs) f.o.t.				12	10	0
Gas strip	10	15	0 to	12	0	0
Bolts and nuts, ¼ in. × 4 in.				15	5	0
Steel—						
Ship plates	8	15	0 to	8	17	6
Boiler plts.	9	15	0 to	10	10	0
Chequer plts.				10	12	6
Angles				8	7	6
Tees				9	7	6
Joists				8	10	0
Rounds and squares, 3 in. to 5½ in.				9	7	6
Rounds under 3 in. to ¼ in. (Untested)				7	15	0
				and upwards		
Flats—8 in. wide and over				8	12	6
„ under 8 in. and over 5 in.				8	17	6
Rails, heavy				8	10	0
Fishplates				12	0	0
Hoops (Staffs)	9	5	0 to	9	15	0
Black sheets, 24 g.	9	12	6 to	9	15	0
Galv.cor.shts., 24g.				11	12	6
Galv. fencing wire, 8g. plain				12	0	0
Billets, soft	5	15	0 to	6	5	0
Billets, hard	7	10	0 to	8	0	0
Sheet bars				5	15	0
Tin bars				5	15	0

PHOSPHOR BRONZE.

	Per lb. basis.
Strip	1/0½
Sheet to 10 w.g.	1/1
Wire	1/1½
Rods	1/1
Tubes	1/5½
Castings	1/1

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. Clifford & Son, Limited.

NICKEL SILVER, &c.

	per lb.
Ingots for raising	8d. to 1/2
Rolled—	
To 9 in. wide	1/2 to 1/8
To 12 in. wide	1/2½ to 1/8½
To 15 in. wide	1/2½ to 1/8½
To 18 in. wide	1/3 to 1/9
To 21 in. wide	1/3½ to 1/9½
To 25 in. wide	1/4 to 1/10
Ingots for spoons and forks	8d. to 1/4½
Ingots rolled to spoon size	11d. to 1/7½
Wire round—	
3/0 to 10 G.	1/5½ to 2/0½

with extras according to gauge.

AMERICAN IRON AND STEEL.

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	19.76
No. 2 foundry, Valley	18.00
No. 2 foundry, Birm.	14.00
Basic	19.76
Bessemer	20.26
Malleable	20.26
Grey forge	19.26
Ferro-mang. 80%	94.00
O.-h. rails, h'y, at mill	43.00
Billets	31.00
Sheet bars	31.00
Wire rods	36.00
	Cents.
Iron bars, Phila.	2.09
Steel bars	1.60
Tank plates	1.60
Beams, etc.	1.60
Skelp, grooved steel	1.70
Skelp, sheared steel	1.70
Steel hoops	1.95
Sheets, black, No. 24	2.40
Sheets, galv., No. 24	3.00
Sheets, blue an'l'd, No. 13	2.05
Wire nails	2.00
Plain wire	2.30
Barbed wire, galv.	2.70
Tinplates, 100-lb. box	$5.25

COKE (at ovens).

Welsh foundry	26/- to 27/6
„ furnace	18/- to 21/6
Durham and Northumberland—	
„ foundry	14/6 to 15/-
„ furnace	14/6
Midlands, foundry	—
„ furnace	—

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 box	17/-
„	28×20 „	34/-
„	20×10 „	24/6
„	18¾×14 „	17/9
C.W.	20×14 „	15 6
„	28×20 „	32/6
„	20×10 „	23/6
„	18¾×14 „	17/-
Terneplates	28×20	31/6 per box basis f.o.b.

SWEDISH CHARCOAL IRON & STEEL.

Pig-iron	£6 0 0 to £7 10 0
Bars, hammered, basis	£17 10 0 to £18 10 0
Bars and nail-rods, rolled, basis	£15 17 6 to £16 15 0
Blooms	£10 0 0 to £12 0 0
Keg steel	£32 0 0 to £33 0 0
Faggot steel	£20 0 0 to £24 0 0
Bars and rods dead soft, steel	£11 0 0 to £14 0 0

All per English ton, f.o.b. Gothenburg.

TUBES AND FITTINGS.

Over ¼ in. up to 6 in.

	Tubes.	*Fittings.*
Gas	62½%	47½%
Water ..	58½%	42½%
Steam ..	55%	37½%

W.I. 12½% extra.

DAILY FLUCTUATIONS.

Standard Copper (cash).

		£	s.	d.	
Sept.	25 ..	45	1	3	dec. 3/9
,,	26 ..	44	10	0	,, 11/3
,,	29 ..	43	7	6	,, 22/6
,,	30 ..	43	10	0	inc. 2/6
Oct.	1 ..	43	17	6	,, 7/6

Electrolytic Copper.

		£	s.	d.	
Sept.	25 ..	48	10	0	dec. 10/-
,,	26 ..	48	10	0	No change
,,	29 ..	47	0	0	dec. 30/-
,,	30 ..	46	10	0	,, 10/-
Oct.	1 ..	46	10	0	No change

Standard Tin (cash).

		£	s.	d.	
Sept.	25 ..	131	7	6	dec. 27/6
,,	26 ..	130	17	6	,, 10/-
,,	29 ..	127	17	6	,, 60/-
,,	30 ..	125	5	0	,, 52/6
Oct.	1 ..	125	0	0	,, 5/-

Tin (English ingots).

		£	s.	d.	
Sept.	25 ..	132	10	0	dec. 25/-
,,	26 ..	132	0	0	,, 10/-
,,	29 ..	129	0	0	,, 60/-
,,	30 ..	126	10	0	,, 50/-
Oct.	1 ..	126	10	0	No change

Zinc Sheets (English).

		£	s.	d.	
Sept.	25 ..	26	0	0	No change
,,	26 ..	26	0	0	,, ,,
,,	29 ..	26	0	0	,, ,,
,,	30 ..	26	0	0	,, ,,
Oct.	1 ..	26	0	0	,, ,,

Spelter (ordinary).

		£	s.	d.	
Sept.	25 ..	15	7	6	dec. 2/6
,,	26 ..	15	5	0	,, 2/6
,,	29 ..	15	0	0	,, 5/-
,,	30 ..	14	15	0	,, 5/-
Oct.	1 ..	14	10	0	,, 5/-

Lead (English).

		£	s.	d.	
Sept.	25 ..	19	5	0	No change
,,	26 ..	19	0	0	dec. 5/-
,,	29 ..	18	5	0	,, 15/-
,,	30 ..	18	5	0	No change
Oct.	1 ..	18	0	0	dec. 5/-

AVERAGE MONTHLY PRICES OF UNMARKED BARS (SOUTH STAFFS).

—	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly average.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1897	6 0 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 0 0	6 0 0	6 3 9
1898	6 0 0	6 0 0	6 0 0	6 0 0	6 0 0	6 0 0	6 0 0	6 5 0	6 5 0	6 5 0	6 10 0	6 10 0	6 2 11
1899	3 10 0	6 15 0	6 15 0	6 15 0	7 0 0	7 0 0	7 10 0	7 10 0	8 10 0	9 0 0	9 0 0	9 10 0	7 12 11
1900	10 0 0	10 10 0	10 10 0	10 10 0	10 15 0	10 15 0	10 5 0	10 5 0	10 5 0	9 10 0	8 15 0	8 15 0	10 1 3
1901	8 0 0	7 10 0	7 5 0	7 0 0	6 10 0	6 10 0	6 10 0	6 10 0	6 15 0	6 15 0	6 15 0	6 15 0	6 17 11
1902	7 0 0	6 10 0	6 15 0	6 15 0	6 15 0	6 10 0	6 10 0	6 15 0	6 15 0	6 15 0	6 10 0	6 10 0	6 13 4
1903	6 10 0	6 10 0	6 10 0	6 10 0	6 10 0	6 10 0	6 10 0	6 10 0	6 10 0	6 10 0	6 7 0	6 5 0	6 9 4
1904	6 5 0	6 5 0	6 5 0	6 5 0	6 10 0	6 5 0	6 0 0	6 0 0	6 0 0	6 0 0	6 0 0	6 0 0	6 2 11
1905	6 5 0	6 5 0	6 0 0	5 17 6	5 15 0	5 15 0	5 15 0	5 15 0	6 0 0	6 5 0	6 15 0	6 15 0	6 1 10½
1906	7 0 0	7 5 0	7 5 0	7 5 0	6 17 6	6 15 0	6 12 6	6 10 0	6 10 0	6 12 6	6 16 3	7 3 9	6 17 8½
1907	7 3 9	7 5 0	7 5 0	7 5 0	7 5 0	7 7 6	7 5 0	7 7 6	7 7 6	7 7 6	7 7 6	7 5 0	7 5 11
1908	7 2 6	7 0 0	7 0 0	7 0 0	6 15 0	6 7 6	6 5 0	6 2 6	6 2 6	6 2 6	6 2 6	6 0 0	6 10 0
1909	6 0 0	6 0 0	6 0 0	5 17 6	6 0 0	6 0 0	6 0 0	5 17 6	6 0 0	6 2 6	6 2 6	5 17 6	5 19 9½
1910	6 2 6	6 3 4½	6 7 6	6 7 6	6 7 6	6 7 6	6 6 6	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 7
1911	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 5 0	6 10 0	6 12 6	6 16 6	6 7 0
1912	6 18 9	7 1 10	7 2 6	7 8 9	7 18 0	8 0 7	8 2 6	8 3 6	8 5 0	8 6 3	8 7 6	8 8 9	7 17 0
1913	8 11 6	8 10 7½	8 10 0	8 8 1½	8 2 0	8 0 0	7 17 6	7 11 6	7 8 9	7 5 6	6 18 1½	6 17 6	7 16 9
1914	6 17 6	6 15 7½	6 12 6	6 10 0	6 10 0	6 10 0	6 10 0	7 11 10½	8 0 0	7 12 6	7 5 7½	7 6 3	7 1 0
1915	7 11 6	8 5 11	8 8 9	9 6 0	10 3 2	10 19 2	11 12 6	11 13 1½	11 13 9	11 14 3	12 1 10½	13 0 9	10 6 0
1916	13 7 6	13 10 8	13 12 9½	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 3 9½
1917	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0	13 15 0
1918	13 15 0	13 17 3	13 17 6	13 17 6	13 17 6	13 17 6	13 17 6	14 15 0	14 15 0	14 15 0	14 15 0	14 15 0	14 4 5½
1919	15 10 0	16 5 0	17 15 0	17 15 0	20 15 0	21 0 0	21 0 0	22 0 0	22 0 0	22 0 0	22 7 6	22 12 6	20 1 8
1920	24 7 6	24 10 0	25 10 0	27 10 0	29 5 0	31 0 0	31 10 0	31 10 0	31 10 0	31 10 0	31 10 0	29 7 6	29 1 8
1921	26 17 3	25 0 0	23 0 0	21 0 0	19 0 0	18 5 0	16 0 0	16 0 0	15 14 0	14 0 0	13 6 8	13 0 0	19 4 5
1922	13 0 0	12 3 9	11 14 0	11 11 10½	11 5 0	11 3 6	11 2 6	11 5 0	10 17 2½	10 16 3	10 13 0	10 12 6	11 7 0½
1923	10 16 10½	11 3 1½	12 2 6	12 8 9	12 11 6	12 1 3	11 15 11½	11 15 0	11 15 0	11 15 0	12 13 6	12 8 3	11 18 10½
1924	12 9 6	12 10 0	12 10 0	12 15 7½	12 17 6	12 17 6	12 17 6	12 17 6	12 17 6	12 14 0	12 12 6	12 12 6	12 14 3½
1925	12 12 6	12 12 6	12 12 6	12 12 6	12 12 6	12 7 6	12 7 6	12 7 6	12 4 6	11 18 6	11 13 9	11 13 0	12 6 2½
1926	11 7 9½	11 5 0	11 5 0	11 5 0	11 3 9	11 3 9	11 5 0	12 0 0	13 0 0	*	15 7 6	12 19 0	12 0 2
1927	12 6 3	12 2 6	11 14 0	11 0 0	10 18 9	10 13 6	10 12 6	10 5 0	9 16 0	9 15 0	9 13 9	9 12 9	10 14 2
1928	9 12 6	9 12 6	9 11 0	9 10 0	9 8 4	9 5 0	9 5 0	9 5 0	9 5 0	9 5 0	9 3 6	9 1 3	9 7 0
1929	9 0 0	9 2 6	9 5 7½	9 9 4½	9 10 0	9 17 6	10 2 6	10 2 6	10 2 6	10 0 6	10 3 9	10 5 7½	9 15 2½
1930	10 7 6	10 7 6	10 7 6	10 6 10½	10 6 3	10 5 0	10 2 6	10 2 6	10 2 6	—	—	—	—

* No quotations available owing to strike.

WILLIAM JACKS & COMPANY,

WINCHESTER HOUSE, OLD BROAD ST., LONDON, E.C.2.

18, BENNETTS HILL, BIRMINGHAM.

PIG IRON

REGISTERED TRADE MARK

All grades FOUNDRY, HEMATITE, BASIC, SPECIALS, &c.

NON-FERROUS METALS

COPPER, TIN, LEAD, SPELTER, ANTIMONY, CHROME ORE.

WILLIAM JACKS & COMPANY,

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ZETLAND ROAD, MIDDLESBROUGH.

SMALL ADVERTISEMENTS.

Notice.

Small Advertisements in this section of the Journal are accepted at the prepaid rate of 6d. per line, first line in capitals counting two, average 6 words per line. Minimum charge for one insertion 3 -.

(A remittance should accompany instructions.)

SITUATIONS VACANT AND WANTED.

METALLURGIST (Graduate), aged 31, seeks responsible post, technical or commercial, home or abroad. Extensive experience in both non-ferrous and ferrous laboratory work, inspection, and works management.—Box 624, Offices of The Foundry Trade Journal, 49, Wellington Street, Strand, London, W.C.2.

FOUNDRY Foreman required for iron foundry making castings ranging from ounces up to about 3 tons. Must be well acquainted with modern practice, rate-fixing, and a good disciplinarian.—Apply, giving full particulars of age, experience, wage required, to The Wigston Foundry Company, Limited, South Wigston, near Leicester.

MANAGER required for a foundry near Leicester making medium weight and light iron castings.—Apply, giving full particulars of experience, references, age, and salary required, all of which will be treated in strict confidence, to Box 630, Offices of The Foundry Trade Journal, 49, Wellington Street, Strand, London, W.C.2.

AGENCIES.

YOUNG Englishman, in Belgium for 10 years, good business experience, well connected, best references, seeks Agency of British firm; industrial centre.—Write H. D., Box 632, Offices of The Foundry Trade Journal, 49, Wellington Street, Strand, London, W.C.2.

AGENT required to represent Manchester brass and iron founders on commission basis. Only men who have good connection need apply.—Box 622, Offices of The Foundry Trade Journal, 49, Wellington Street, Strand, London, W.C.2.

Representative now calling on British Foundries is required by German Manufacturer to introduce an improved and cheapened mixture for pattern plate making. Sound knowledge of German an advantage. Applications are requested from gentlemen well introduced and prepared to work hard.

Apply:—

INGENIEUR R. STRAUCH,
Sparolith - Modellplatten - Werke,
Werchow bei Calau,
GERMANY.

PATENTS AND TRADE MARKS.

PROTECT YOUR IDEAS.—Free, Advice and Handbook on patenting inventions and registering trade marks by Registered Agent with 43 years' experience.—King's Patent Agency, Limited, 146a, Queen Victoria Street, E.C.4.

PATENTS AND TRADE MARKS—*Continued.*

THE Proprietor of British Patents Nos. 227968 and 228070, both dated November 27, 1923, relating to "Improvement in machines and methods for making foundry moulds and cores" and "Vents for Moulders' Flasks and Core Boxes," respectively, is desirous of entering into arrangements by way of a licence or otherwise on reasonable terms for the purpose of exploiting the above patents and ensuring their practical working in Great Britain.—All inquiries to be addressed to B. Singer, Steger Building, Chicago, Illinois.

BUSINESS FOR SALE.

BRITANNIA FOUNDRY COMPANY, LIMITED, COVENTRY.

FOR Sale, the Goodwill, including all drawings and patterns of moulding machines and foundry requisites, also iron and non-ferrous foundries. Offers for the engineering side or foundry side alone will be considered.—Apply, E. T. Peirson & Sons, 16/17, Hertford Street, Coventry.

PROPERTY.

11 ACRES WORKS SITE.
SHEFFIELD.

145,000 Sq. Ft. of SHOPPING,
Compact and Convenient,
SIDING CONNECTIONS
with L.M. & S. and L. & N.E. Rlys.
WELL-BUILT & COMMODIOUS OFFICES

Will Sell whole or in lots to suit customers or Let on favourable terms. Unique opportunity for Manufacturers.

Apply—
THOS. W. WARD, LTD.,
ALBION WORKS, SHEFFIELD.

BRISTOL.

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